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Epidemiology of psoriasis and palmoplantar pustulosis: a nationwide study using the Japanese national claims database

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ABSTRACT

Objective: The primary objective is to estimate the national prevalence of psoriasis and PPP. Secondary objectives are to know (1) whether the disease activity of psoriasis and PPP varies seasonally, and (2) whether the disease severity is associated with concurrent diabetes mellitus, hyperlipidemia and hypertension.

Settings: Patients with a diagnosis code of psoriasis or PPP in a claim issued by any medical institution were identified using Japanese national database between April 2010 and March 2011.

Participants: A total of 565,903 patients with psoriasis or PPP were identified. No patient was excluded.

Primary and Secondary Outcome Measures: The national prevalence was calculated using the census data. We estimated the difference of proportion of patients who used healthcare service, as a proxy of disease activity, between hot and cold seasons and that of standardized prevalence of comorbidities between severe and mild diseases. The measures were finally estimated in two diseases separately but not in all patients as planned because two diseases were found different for major aspects.

Results: The national prevalence of psoriasis and PPP was 0.34% (95% CI 0.34 to 0.34%) and 0.12% (0.12 to 0.12%), respectively. The difference of the proportion of patients who used healthcare service in the hottest and coldest seasons was -0.3% (-0.5 to -0.1%) for psoriasis and 10.0% (9.8 to 10.3%) for PPP. The difference of the standardized prevalence between severe and mild psoriasis was 3.1% (2.7 to 3.4%), 3.2% (2.8 to 3.6%) and 5.1% (4.7 to 5.6%) for concurrent diabetes mellitus, hyperlipidemia and hypertension, respectively. No significant difference of the prevalence of comorbidity was observed for PPP.

Conclusions: The national prevalence, seasonal variation of disease activity and prevalence of comorbidities in Japanese patients with psoriasis and PPP estimated in this descriptive study may be used as the basic information in the future studies.

Strengths and limitations of this study

- This study estimated the national prevalence of psoriasis and palmoplantar pustulosis (PPP) using the national database covering more than 90% of the whole Japanese population.
- The seasonal variation of the use of the healthcare service, as a proxy of disease activity, treatments for psoriasis and PPP and the prevalence of concurrent diabetes mellitus, hyperlipidemia and hypertension are also examined.
- The main limitation of the current study is that the diagnosis codes of psoriasis and PPP are not validated.
- To address the concern for possible misclassification of psoriasis and PPP by the non-specialist, results in the subgroups divided by the specialty of the department that provided the healthcare service are shown in online supplementary tables.

INTRODUCTION

Psoriasis is a chronic immune-mediated disease affecting 2-4% of population in the US and Europe ,[1-3]. However, according to the recent epidemiological studies, the prevalence of psoriasis in Asian countries is lower than that in the Western countries ,[4,5]. Palmoplantar pustulosis (PPP), first described as a variant of pustular psoriasis ,[6], has been regarded as a rare disease in the Western countries ,[7] but its prevalence in Asia is not known.

Databases including claims databases have been sometimes used to study epidemiology of diseases including psoriasis ,[1,4]. Japanese universal multi-payer health-care system covering virtually all citizens was started already in 1961 but it was only recently that the Japanese national database of health insurance claims (JNDB) was created by the Ministry of Health, Labour and Welfare. The JNDB has accumulated data of all claims in electronic format issued in April 2009 or later. Since 2011, the JNDB was made available on a trial basis for the research and other secondary purposes. In the current study, we used the JNDB data to estimate the national prevalence and some of relevant epidemiological characteristics of psoriasis and PPP in Japanese population.

MATERIALS AND METHODS

Acquisition of claims data

All the patients with diagnosis codes of psoriasis and PPP in outpatient or inpatient claims issued in electronic format between April 2010 and March 2011 were identified. The proportion of claims in electronic format was 97.9 and 99.6 % for claims issued from hospitals, 76.0 and 91.2% for those from clinics and 99.9 and 99.9% for those from community pharmacies in April 2010 and in March 2011, respectively. For claims from clinics, 89.5% were in electronic format already in August 2010 ,[8]. We selected all of the standardized domestic diagnosis codes mapped to L400 to L409 of the 10th revision of the International Statistical Classification of Diseases (ICD-10) in the master table of diagnosis codes for claims in electronic format maintained by the Medical Information System Development Center, Tokyo, Japan. In the provided data, a pair of two kinds of identifiers (defined as ID1 and ID2) was given to all the claims of each patient. Those identifiers were newly created in the JNDB because the social security number or other unique identifier is not used in Japanese healthcare system. Of these two, ID1 was generated by encrypting the combination of health card number given by each insurer, date of birth and sex and ID2 was generated by encrypting the combination of name, date of birth and sex. The former (ID1) may be useful to identify the subject when the patient's family name is changed (e.g., from the maiden to married name) while the latter (ID2) may be useful to identify the patient when the subject becomes insured by a different insurer (e.g., due to job change). Regarding the demographic data, sex and age group of 5-year interval (0-4, 5-9, ---, 80-84, and 85 years of age or older) were provided. We obtained diagnosis codes of concurrent diabetes mellitus, hyperlipidemia and hypertension and codes of drugs to treat those 3 comorbidities as well as drugs and

phototherapy for the treatment of psoriasis and PPP. In Japanese health insurance system, for patients who used the healthcare service, one outpatient claim and/or one inpatient claim from one hospital or clinic are issued for one patient in each month. Similarly, one claim from one community pharmacy is issued for one patient in each month. We obtained the information of year and month of the claims issued for the study subjects together with codes of diagnoses and treatments used in the study. We have also collected the specialty of the department in a claim with a diagnosis code of psoriasis and PPP issued from a hospital or clinic though this information is not a required condition for the reimbursement and often not available.

The study was approved by the ethics committee of the Graduate School and Faculty of Medicine, University of Tokyo in October 2011 (No. 3586).

Statistical Analysis

The prevalence of psoriasis and PPP in the nation were estimated by the counts of patients with a diagnosis code of psoriasis and PPP divided by the population size in the census as of October 2010. The normal approximation confidence interval (CI) of the prevalence was also estimated. A total of 21 local diagnosis codes were classified into the following 8 disease subclasses: (1) plaque psoriasis ("psoriasis vulgaris" (L400), "psoriasis" (L409), "psoriasis vulgaris of entire body" (L400), "psoriasis of extremities" (L400), "psoriasis vulgaris of extremities" (L400), "psoriasis vulgaris of lower back" (L400) and "plaque psoriasis" (L400)), (2) scalp psoriasis ("seborrheic psoriasis" (L400) and "psoriasis vulgaris of scalp" (L400)), (3) guttate psoriasis (L404), (4) psoriatic arthritis ("psoriatic arthritis" (L405), "psoriatic arthritis mutilans" (L405) and "psoriatic spondylitis" (L405)), (5) pustular psoriasis ("pustular psoriasis" (L401), "impetigo

herpetiformis" (L401), "acrodermatitis continua" (L402), "generalized pustular psoriasis" (L401) and "acute generalized pustular psoriasis" (L401)), (6) erythrodermic psoriasis (L408), (7) PPP (L403) and (8) pustulotic arthro-osteitis (PAO) (L403). Patients were further broadly classified into "patients with PPP" when they had a diagnosis code of PPP or PAO but no other diagnosis code. Otherwise, patients were classified into "patients with psoriasis". These two broad disease categories were used on an ad hoc basis because the number of patients with PPP was much larger than expected and patients under two disease categories were found to be different for several important aspects. When the average age was calculated, we used the midpoint of the 5-year interval (e.g., 37 years old for age group 35-39).

To estimate the seasonal variation of the use of the healthcare service for psoriasis and PPP, as a proxy for disease activity, we counted the number of patients in each month during the 12-month observation period for whom an outpatient or inpatient claim with a diagnosis code of psoriasis or PPP was issued. Patients were then divided into 4 groups according to the combination of two dummy variables, X and Y, where the values were assigned as follows: X=1 if the patient used the healthcare service for psoriasis or PPP in the hottest season (July or August of 2010) while X=0 otherwise, and, Y=1 if the patient used the service in the coldest season (January or February of 2011) while Y=0 otherwise. We estimated the difference (and its 95% confidence interval) between the mean of X (the proportion of patients who used the service in the hottest season) and the mean of Y (the proportion of patients who used the service in the coldest season) and the difference was tested by the paired t-test.

Treatments for psoriasis and PPP were classified as systemic therapy (adalimumab, infliximab, ustekinumab, methotrexate, ciclosporin and etretinate), phototherapy and

topical therapy (topical vitamin D and topical corticosteroid). To know the distribution of treatments for psoriasis and PPP, one patient was counted once for each treatment and the proportion of males and the average age were calculated for each treatment group. In addition, for each therapy, the proportion of patients with psoriatic arthropathy in the broad category of psoriasis and that with PAO in the broad category of PPP was calculated to know which treatment was preferred for patients with arthropathy.

To examine whether the concurrent diabetes mellitus, hyperlipidemia and hypertension are more frequent in the patients with severe psoriasis and PPP, the treatment for psoriasis and PPP was used as a surrogate of the severity of psoriasis and PPP. Patients were subdivided into the following severity classes I to IV: patients with one or more of systemic therapies (Class I), patients with phototherapy but no systemic therapy (Class II), patients with topical therapy only (Class III) and patients with no treatment for psoriasis or PPP (Class IV). Patients were defined to have diabetes mellitus when they had a diagnosis code of diabetes mellitus at least in one claim as well as codes of anti-diabetic drugs in claims issued in two or more different months during the 12-month observation period. Similarly, patients were defined to have hyperlipidemia and hypertension, respectively, when they had a diagnosis code of the disease at least in one claim as well as codes of drugs to treat the disease (i.e., lipid-lowering drugs and anti-hypertensive drugs, respectively) in claims issued in two or more months. The prevalence of diabetes mellitus, hyperlipidemia and hypertension in each severity class of psoriasis and PPP was standardized to the distribution of age and sex in the entire study population. The difference of the standardized prevalence and its 95% CI were estimated using the severity class III as a

reference ,[9].

To assess who provided the healthcare service, we obtained the specialty of the department specified in a claim with a diagnosis code of psoriasis and PPP. Patients were subdivided into the following 3 department subgroups: (A) “patients of dermatology or rheumatology” when the department was specified as either of dermatology and rheumatology at least in one claim with a diagnosis code of psoriasis or PPP, (B) “patients of other specialty” when the department was specified as other specialty at least in one claim but not as dermatology or rheumatology in any claim and (C) “patients of the department not specified” when the department was not specified in any claim. Demographic and other characteristics of patients with psoriasis and PPP examined in each of 3 department subgroups were shown in online supplementary tables.

All the statistical analyses were conducted by SAS (Version. 9.3, SAS Institute Inc. Cry, NC).

RESULTS

Prevalence and demographic characteristics of psoriasis and PPP

We identified 565,903 patients with psoriasis or PPP from a total of 681,827 ID1s and 778,767 ID2s assuming that all the pairs of ID1 and ID2 represented the same patient when ID1 or ID2 of the pairs was identical. Using the size of the total population (128 million) in the census data as of October 2010, a total number of 565,903 accounted for 0.44% (95% CI 0.44 to 0.44%) of the prevalence in the nation. The 565,903 patients were broadly classified into 429,679 patients with psoriasis (the national prevalence=0.34%, 95% CI 0.34 to 0.34%) and 136,224 patients with PPP. Because 12,663 patients classified under the broad category of psoriasis had a diagnosis code of PPP or PAO as well, 148,887 patients (the national prevalence=0.12%, 95% CI 0.12 to 0.12%) had a diagnosis code of PPP or PAO. Those 12,663 patients with both diagnosis codes of psoriasis and PPP accounted for 2.9% of 429,679 with a diagnosis code of psoriasis and 8.5% of 148,887 with a code of PPP or PAO. Table 1 shows the age-sex distribution of patients with psoriasis and PPP. About 60% were male (male to female ratio=1.44) and the average age was 56.7 years old in patients with psoriasis while about two thirds were female (male to female ratio=0.53) and the average age was 55.5 years old in patients with PPP. Figure 1 shows the national prevalence of psoriasis and PPP in males and females estimated using the census data. For both males and females, the age group 75 to 79 had the highest prevalence in patients with psoriasis while the age group 55 to 59 for females and the age group 60 to 64 for males had the highest prevalence in patients with PPP. In online supplementary table S1, demographic characteristics of patients subdivided into the 3 department subgroups A (dermatology/rheumatology), B (other specialty) and C (not specified) are shown. Of a

total of 429,679 patients with psoriasis, 132,189 (30.8%), 33,763 (7.9%) and 263,727 (61.4%) were classified into subgroups A, B and C, respectively. Of a total of 136,224 patients with PPP, 24,195 (20.0%), 12,411 (9.1%) and 96,618 (70.9%) were classified into subgroups A, B and C, respectively. The male to female ratio was 1.58, 1.33 and 1.39 for psoriasis and 0.52, 0.50 and 0.54 for PPP and the average age was 58.1, 61.8 and 55.3 years old for psoriasis and 57.2, 56.9 and 54.9 years old for PPP in subgroups A, B and C, respectively.

Domestic diagnosis codes

The distribution of domestic diagnosis codes divided into 8 diagnosis subgroups is shown in Table 2. In patients under the broad category of psoriasis, the proportion of males was lower than 50% for guttate psoriasis, pustular psoriasis, PPP and PAO but higher than 70% for erythrodermic psoriasis. Patients with guttate psoriasis were younger but patients with erythrodermic psoriasis were older than other types of psoriasis. In patients under the broad category of PPP, patients with PAO included more females and were younger than patients without PAO. When patients were subdivided into 3 department subgroups, more than half of patients were in the department subclass A (dermatology/rheumatology) for "pustular psoriasis" (2,953/4,636), "erythrodermic psoriasis" (1,045/1,610) and "psoriatic arthritis" (4,530/8,360) (online supplementary table S2).

Seasonal variation of the use of healthcare service

Figure 2 shows the seasonal variation of the use of the healthcare service in patients with psoriasis and PPP. On average, about 39% of patients with psoriasis and 36% of

patients with PPP used the healthcare service in each month. In patients with psoriasis, the proportion of patients who used the healthcare service in the hottest season (July or August of 2010) (52.6%) was similar to that in the coldest season (January or February of 2011) (53.0%) and the difference was -0.3% (95% CI -0.5 to -0.1%, P=0.0004). On the other hand, in patients with PPP, the proportion of patients who used the service in the hottest season (55.3%) was higher than that in the coldest season (45.3%) and the difference was 10.0% (9.8 to 10.3%, P<0.0001). As shown in online supplementary tables S3 and S4, the predominance of the use of the healthcare service in the hottest season in patients with PPP but not in patients with psoriasis was also observed in all of the 3 department subgroups.

Treatments for psoriasis and PPP

In table 3, treatments for psoriasis and PPP are summarized. Systemic therapies were used mainly for patients with psoriasis but a few patients with PPP also used etretinate and other systemic therapies. In patients treated by biologics, patients were relatively young and the proportion of patients with arthropathy was high. Of 3,291 patients with psoriasis on a biologic treatment, 2,674 (81.1%) were in the department subgroup A (dermatology/rheumatology) (online supplementary table S5). Phototherapy was more frequently used for patients with PPP than patients with psoriasis while topical vitamin D was selected more frequently for patients with psoriasis than patients with PPP. About 80% of patients with both psoriasis and PPP used topical corticosteroid. No treatment for psoriasis or PPP was given to about 9% of patients with psoriasis and about 16% of patients with PPP. Both for psoriasis and PPP, patients with no treatment included more patients with arthropathy when

compared with those with topical therapy particularly in the department subgroup B (other specialty) (online supplementary table S5).

Comorbidities of psoriasis and PPP

Table 4 shows the number of patients and standardized prevalence of concurrent diabetes mellitus, hyperlipidemia and hypertension in the severity classes I to III in patients with psoriasis and PPP. For patients with psoriasis, the standardized prevalence was higher in Class I (systemic therapy) than in Class III (topical therapy only) in the entire population as well as in 3 department subgroups (online supplementary table S6). The prevalence was similar between Class II (phototherapy) and Class III except for the department subgroup A (dermatology/rheumatology) where the prevalence was higher in Class II than in Class III. The prevalence of the comorbidities was lower in Class IV (no treatment) than Class III in the department subgroup A (dermatology/rheumatology) but higher in Class IV than in Class III in other department subgroups (online supplementary table S6). For patients with PPP, no remarkable difference was observed between Classes I, II and III.

DISCUSSION

We identified about 0.34% of patients with a diagnosis code of psoriasis and 0.12 % with a code of PPP in the JNDB during the 12-month period between April 2010 and March 2011. About 60% of patients with psoriasis were males while about two thirds of patients with PPP were females. The use of the healthcare service was roughly constant during the 12-month observation period in patients with psoriasis while the use of the service prevailed in summer in patients with PPP. The prevalence of the concurrent diabetes mellitus, hyperlipidemia and hypertension in patients with psoriasis receiving a systemic therapy was higher than that in those receiving a topical therapy only.

The prevalence of psoriasis in our study, 0.34%, was lower than 2 to 4 % in the Western countries and the male predominance in our study was different from the almost equal distribution of males and females in the Western countries ,[1-3]. The low prevalence and male predominance of patients with psoriasis were also found in other Asian countries: e.g., the prevalence of males and females was 0.23% and 0.16 % in Taiwan ,[4] and 0.54% and 0.44% in China ,[5], respectively. On the other hand, the prevalence of PPP in our study, 0.12% was higher than 0.01 to 0.05% in the Western countries though the female predominance in the current study was also observed in the Western countries ,[7,10,11]. Around 20% of patients with PPP were reported to have psoriasis ,[7,12] and in our study, 8.5% of patients with diagnosis code of PPP or PAO had psoriasis. We observed that the male to female ratio was different between psoriasis and PPP and that psoriasis was more prevalent in the older age group than PPP. The seasonal variation of the use of the healthcare service in patients with PPP, as a proxy of the disease activity, was not observed in patients with psoriasis. Those

findings are in accordance with the proposal in the International Psoriasis Council in 2007 that PPP should be considered a separate condition from psoriasis ,[11,13].

About 9% of patients with psoriasis and 16% of patients with PPP had no therapy for psoriasis and PPP in our study. In the previous study in the UK, one third of patients with psoriasis were not using any therapy at the time of evaluation ,[1]. According to a survey conducted in the US between 2003 and 2011, 49, 24 and 9% of patients with mild, moderate and severe psoriasis were untreated and about half of patients were dissatisfied with their treatment ,[14]. In our study, patients with no treatment for psoriasis and PPP included more patients with arthropathy than those with topical therapy particularly in the department subgroup B (other specialty) where the severity class IV (no treatment) might represent more severe psoriasis or PPP than the severity class III (topical therapy only).

Many studies conducted in the Western and Asian countries reported that the prevalence and incidence of the risk factors for myocardial infarction and stroke such as diabetes mellitus, hyperlipidemia and hypertension were high in patients with psoriasis, particularly in those with severe psoriasis ,[15-18]. Psoriasis itself may be the direct risk factor for those conditions but the increased risk of those conditions may be due to the high prevalence of obesity and other known predisposing factors ,[19]. It is also possible that some of the comorbidities are adverse reactions to ciclosporin and other systematic therapies for psoriasis ,[20]. In our study, the increase of the comorbidity was observed in patients with severe psoriasis but not in patients with severe PPP when compared with patients with topical therapy only. This observation may indicate that psoriasis is a direct risk factor. However, another interpretation may be that ciclosporin is the major contributor to the high prevalence of the comorbidity because

ciclosporin was used by more than half of patients with psoriasis receiving a systemic therapy while ciclosporin was used only by 10% of those with PPP receiving a systematic therapy.

The main limitation of the current study is that the diagnosis codes of psoriasis and PPP are not validated. Therefore, the true national prevalence may be higher or lower than that reported in the current study. One concern is misclassification of diseases particularly when the diagnosis is made by a non-specialist. However, demographic characteristics and other major findings were common to the whole population and department subgroup A (dermatology/rheumatology). This finding would suggest that the whole patients identified by diagnosis codes of the claims in the current study roughly represented patients with psoriasis and PPP who used healthcare service during the observation period in the nation. Nevertheless, we could not exclude some types of misclassification. For instance, the proportion of guttate psoriasis in patients with psoriasis was around 4% in a previous study in Japan ,[21] and higher than 0.6% in the current study (table 2), which could be due to misclassification. The strength of the study is the use of the claims database covering most (more than 90%) patients in the nation.

In conclusion, the study using the JNDB collected from the whole nation revealed that the prevalence of psoriasis was lower and the prevalence of PPP was higher than that in the Western countries. As in the previous studies, the severe psoriasis was associated with the high prevalence of the concurrent diabetes mellitus, hyperlipidemia and hypertension. The national prevalence and other characteristics of psoriasis and PPP estimated in the current descriptive study may provide the basic information for the future studies.

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Contributors KK conceived and designed the study, analyzed and interpreted the data and drafted the manuscript. YK analyzed and interpreted the data. TS, NO and DK contributed to procedures to acquire the data and interpreted the data. HI and HN contributed to conception and design of the study. In addition, all authors carefully reviewed the draft and revised it critically. All authors gave the final approval of the manuscript.

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Table 1

Age-sex distribution of patients with psoriasis and PPP in Japanese National Database

	Psoriasis*			PPP		
	N			N		
Age	Male	Female	Total	Male	Female	Total
0-9	3,376	3,177	6,553	396	382	778
10-19	4,430	5,046	9,476	689	923	1,612
20-29	9,800	9,904	19,704	1,821	3,673	5,494
30-39	27,915	22,251	50,166	5,049	9,388	14,437
40-49	34,637	21,588	56,225	7,256	13,237	20,493
50-59	44,963	28,146	73,109	10,318	23,157	33,475
60-69	59,510	33,907	93,417	12,384	23,021	35,405
70-79	48,072	30,930	79,002	7,070	11,559	18,629
80-	21,070	20,957	42,027	2,265	3,636	5,901
Total	253,773	175,906	429,679	47,248	88,976	136,224

* Patients with both of diagnosis codes of psoriasis and PPP are classified as those with psoriasis

PPP, palmoplantar pustulosis.

Table 2

Diagnoses given in claims for patients with psoriasis and PPP in Japanese National Database

Diagnoses	N *	(%)	Male	(%)	Age	(SD)
Psoriasis						
Plaque psoriasis	418,705	(97.4)	248,770	(59.4)	56.7	(18.7)
Scalp psoriasis	2,832	(0.7)	1,682	(59.4)	57.2	(18.1)
Guttate psoriasis	2,572	(0.6)	1,136	(44.2)	42.4	(20.6)
Psoriatic arthritis	8,360	(1.9)	4,431	(53.0)	55.5	(15.1)
Pustular psoriasis	4,636	(1.1)	2,250	(48.5)	55.9	(19.3)
Erythrodermic psoriasis	1,610	(0.4)	1,176	(73.0)	60.4	(17.2)]
PPP †	12,625	(2.9)	4,675	(37.0)	58.3	(13.7)
PAO †	401	(0.1)	85	(21.2)	53.1	(12.1)
Total	429,679	(100)	253,773	(59.1)	56.7	(18.7)
PPP						
PPP	135,647	(99.6)	47,063	(34.7)	55.5	(15.5)
PAO	5,734	(4.2)	1,307	(22.8)	52.1	(12.6)
Total	136,224	(100)	47,248	(34.7)	55.5	(15.5)

* One patient is counted once for each diagnosis and sum of patients with 8 diagnoses for psoriasis and that of 2 diagnoses for PPP exceed a total.

† Patients with diagnosis codes of psoriasis and PPP or PAO.

PPP, palmoplantar pustulosis; PAO, pustulotic arthro-osteitis.

Table 3

Treatments for psoriasis and PPP in Japanese National Database

PAO	Psoriasis N=429,679				PPP N=136,224			
		Male		Psoriatic arthritis		Male		
	N* (%)	N (%)	Age (SD)	N (%)	N* (%)	N (%)	Age (SD)	N (%)
Systemic therapy								
Adalimumab	1,322 (0.3)	892 (67.5)	50.0 (14.0)	453 (34.3)	64 (0.05)	12 (18.8)	59.1 (12.1)	7 (10.9)
Infliximab	2,141 (0.5)	1,344 (62.8)	48.1 (13.9)	741 (34.6)	197 (0.1)	55 (27.9)	51.5 (13.5)	13 (6.6)
Ustekinumab	--†				--†			
Methotrexate	1,680 (0.4)	1,072 (63.8)	52.0 (15.5)	480 (28.6)	174 (0.1)	53 (30.5)	54.6 (13.4)	19 (10.9)
Ciclosporin	21,997 (5.1)	13,813 (62.8)	53.2 (16.2)	1,604 (7.3)	251 (0.2)	98 (39.0)	52.9 (13.8)	20 (8.0)
Etretinate	15,481 (3.6)	11,025 (71.2)	60.1 (13.6)	609 (3.9)	1,950 (1.4)	725 (37.2)	57.5 (11.7)	35 (1.8)
Phototherapy	21,005 (4.9)	12,370 (58.9)	54.6 (18.1)	309 (1.5)	10,408 (7.6)	3,657 (35.1)	53.3 (15.0)	156 (1.5)
Topical therapy								
Topical vitamin D (59.6)	256,122	156,050 (60.9)	53.4 (18.5)	3,698 (1.4)	42,903 (31.5)	14,276 (33.3)	53.0 (14.9)	612 (1.4)
Topical corticosteroid	349,568 (81.4)	211,744 (60.6)	54.9 (18.1)	5,323 (1.5)	109,692 (80.5)	37,881 (34.5)	53.4 (15.3)	3,576 (3.3)
No treatment	38,224 (8.9)	19,398 (50.7)	58.6 (19.5)	1,851 (4.8)	21,209 (15.6)	7,527 (35.5)	54.6 (16.2)	2,083 (9.8)

Table 3 --- continued

* One patient is counted once for each treatment.

† Less than 10 patients had ustekinumab which was approved in the last month of the observation period.

PPP, palmoplantar pustulosis; PAO, pustulotic arthro-osteitis.

Table 4

Prevalence of diabetes mellitus, hyperlipidemia and hypertension in 3 severity classes of patients with psoriasis and PPP in Japanese National Database

	Psoriasis			PPP		
	Class I Systemic therapy * N=	Class II Photo-therapy † N=	Class III Topical therapy ‡ N=	Class I Systemic therapy * N=	Class II Photo-therapy † N=	Class III Topical therapy ‡ N=
	39,796	18,833	332,826	2,588	10,153	102,274
Diabetes mellitus						
N §	5,271	1,747	32,378	260	686	7,585
Prevalence ¶ (%)	12.7	9.0	9.6	9.3	7.7	8.5
Difference ** (%)	3.1	-0.6	ref	0.8	-0.8	ref
(95%CI)	(2.7,3.4)	(-1.0,-0.2)		(-0.5,2.1)	(-1.4,-0.2)	
Hyperlipidemia						
N §	8,208	3,125	56,561	557	1,731	17,783
Prevalence ¶ (%)	20.7	16.7	17.5	18.3	17.4	17.3
Difference ** (%)	3.2	-0.8	ref	1.0	0.1	ref
(95%CI)	(2.8,3.6)	(-1.3,-0.3)		(-0.6,2.6)	(-0.7,1.0)	
Hypertension						
N §	11,795	4,369	78,996	576	1,885	19,332
Prevalence ¶ (%)	28.5	22.8	23.4	22.4	21.8	21.7
Difference ** (%)	5.1	-0.6	ref	0.6	0.04	ref
(95%CI)	(4.7,5.6)	(-1.2,-0.1)		(-1.0,2.3)	(-0.9,0.9)	

* Patients who had one or more of systemic therapies given in Table 3.

† Patients with phototherapy but no systemic therapy.

‡ Patients with topical vitamin D or topical corticosteroid only.

§ Number of patients with a diagnosis code of the concurrent disease (diabetes mellitus, hyperlipidemia or hypertension) at least in one claim as well as drugs to treat the concurrent disease in the claims issued in 2 or more different months.

¶ Prevalence standardized to the distribution of age and sex in the entire study population of 565,903 subjects.

** Difference in prevalence compared with Class III.

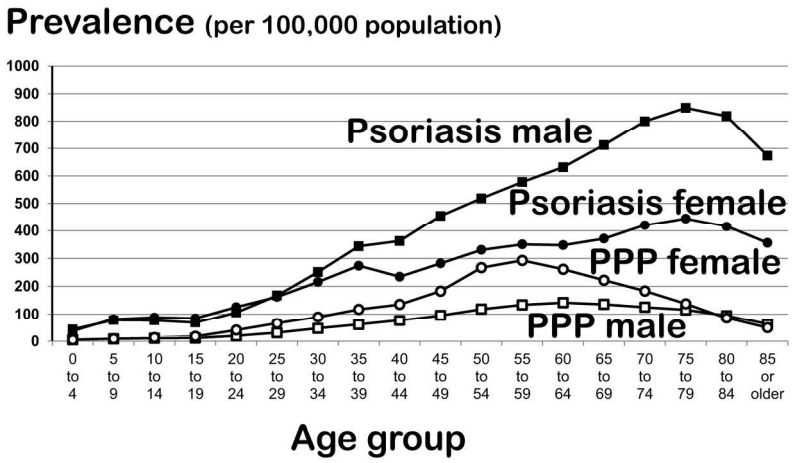
Table 4 --- continued

PPP, palmoplantar pustulosis; CI, confidence interval.

Legends of figures

Figure 1. The national prevalence of psoriasis and palmoplantar pustulosis (PPP) in Japanese population. The prevalence was estimated as the counts of patients with psoriasis or PPP in the Japanese national claims database between April 2010 and March 2011 divided by the population size in the census data as of October 2010.

Figure 2. The use of the healthcare service in patients with psoriasis and palmoplantar pustulosis (PPP). The proportion was estimated as the number of patients for whom a claim with a diagnosis code of psoriasis or PPP was issued in each of 12 months between April 2010 and March 2011 divided by the number of the whole patients with psoriasis and PPP, respectively.



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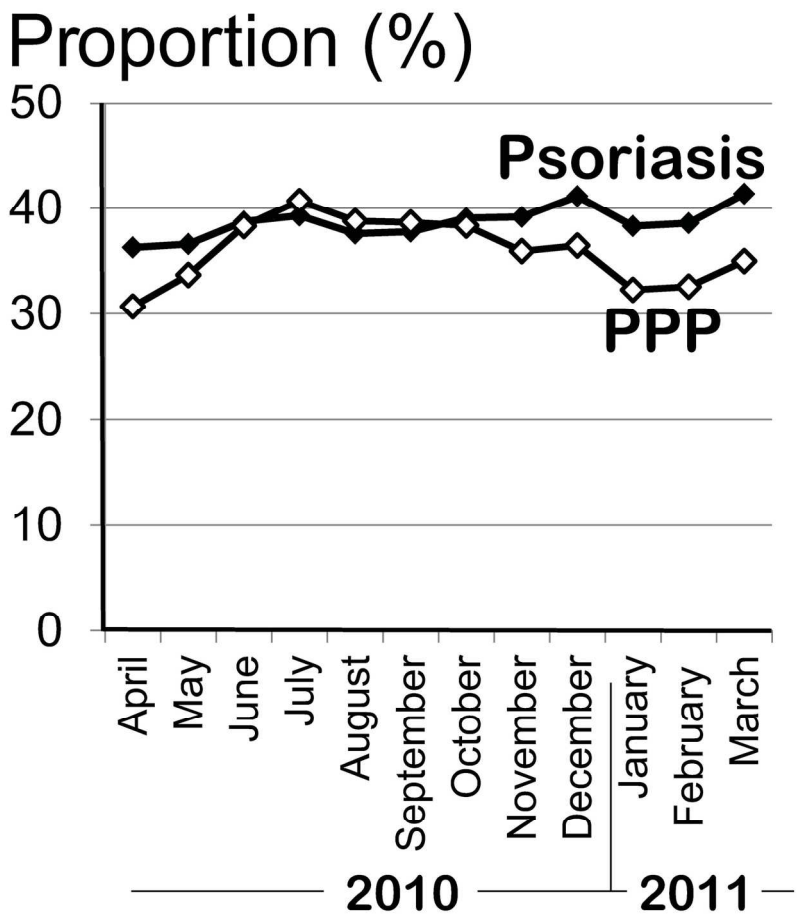

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Supplementary Tables

Supplementary Table S1

Age-sex distribution of patients with psoriasis and PPP subdivided by the department specified in a claim with a diagnosis code of psoriasis and PPP in Japanese National Database

	Psoriasis[a]		PPP	
Age (years old)	Male N (%)	Female N (%)	Male N (%)	Female N (%)
All patients				
0-9	3,376 (1.3)	3,177 (1.8)	396 (0.8)	382 (0.4)
10-19	4,430 (1.7)	5,046 (2.9)	689 (1.5)	923 (1.0)
20-29	9,800 (3.9)	9,904 (5.6)	1,821 (3.9)	3,673 (4.1)
30-39	27,915 (11.0)	22,251 (12.6)	5,049 (10.7)	9,388 (10.6)
40-49	34,637 (13.6)	21,588 (12.3)	7,256 (15.4)	13,237 (14.9)
50-59	44,963 (17.7)	28,146 (16.0)	10,318 (21.8)	23,157 (26.0)
60-69	59,510 (23.5)	33,907 (19.3)	12,384 (26.2)	23,021 (25.9)
70-79	48,072 (18.9)	30,930 (17.6)	7,070 (15.0)	11,559 (13.0)
80-	21,070 (8.3)	20,957 (11.9)	2,265 (4.8)	3,636 (4.1)
Total	253,773 (100)	175,906 (100)	47,248 (100)	88,976 (100)
Mean (SD)	57.1 (17.8)	56.1 (19.9)	55.7 (16.1)	55.5 (15.2)
Patients of dermatology or rheumatology (subgroup A) [b]				
0-9	810 (1.0)	814 (1.6)	36 (0.4)	88 (0.3)
10-19	1,137 (1.4)	1,278 (2.5)	70 (0.8)	110 (0.6)
20-29	2,659 (3.3)	2,561 (5.0)	247 (2.7)	578 (3.2)
30-39	7,677 (9.5)	5,582 (10.9)	828 (8.9)	1,567 (8.8)
40-49	9,831 (12.1)	5,978 (11.7)	1,247 (13.4)	2,464 (13.8)
50-59	13,674 (16.9)	8,607 (16.8)	1,946 (20.9)	4,777 (26.7)
60-69	20,802 (25.7)	11,290 (22.0)	2,851 (30.6)	5,226 (29.2)
70-79	17,355 (21.4)	9,840 (19.2)	1,638 (17.6)	2,493 (13.9)
80-	6,975 (8.6)	5,319 (10.4)	442 (4.8)	623 (3.5)
Total	80,920 (100)	51,269 (100)	9,305 (100)	17,890 (100)
Mean (SD)	58.8 (17.1)	57.1 (19.0)	58.1 (14.8)	56.8 (14.1)

Supplementary Table S1 -- continued

	Psoriasis[a]		PPP	
Age (years old)	Male N (%)	Female N (%)	Male N (%)	Female N (%)
Patients of department other than dermatology or rheumatology (subgroup B) [c]				
0-9	288 (1.5)	232 (1.6)	53 (1.3)	30 (0.4)
10-19	210 (1.1)	225 (1.6)	56 (1.3)	61 (0.7)
20-29	418 (2.2)	476 (3.3)	110 (2.6)	265 (3.2)
30-39	1,304 (6.8)	1,098 (7.6)	384 (9.2)	818 (9.9)
40-49	1,889 (9.8)	1,380 (9.5)	600 (14.4)	1,091 (13.2)
50-59	3,058 (15.9)	2,091 (14.4)	891 (21.4)	2,137 (25.9)
60-69	4,797 (24.9)	3,091 (21.3)	1,165 (28.0)	2,238 (27.1)
70-79	4,825 (25.1)	3,283 (22.6)	669 (16.1)	1,169 (14.2)
80-	2,460 (12.8)	2,638 (18.2)	226 (5.4)	448 (5.4)
Total	19,249 (100)	14,514 (100)	4,154 (100)	8,257 (100)
Mean (SD)	61.7 (17.2)	61.9 (18.9)	56.8 (16.1)	56.9 (15.0)
Patients of department not specified (subgroup C) [d]				
0-9	2,278 (1.5)	2,131 (1.9)	307 (0.9)	300 (0.5)
10-19	3,083 (2.0)	3,543 (3.2)	563 (1.7)	752 (1.2)
20-29	6,723 (4.4)	6,867 (6.2)	1,464 (4.3)	2,830 (4.5)
30-39	18,934 (12.3)	15,571 (14.1)	3,837 (11.4)	7,003 (11.1)
40-49	22,917 (14.9)	14,230 (12.9)	5,409 (16.0)	9,682 (15.4)
50-59	28,231 (18.4)	17,448 (15.8)	7,481 (22.1)	16,243 (25.9)
60-69	33,911 (22.1)	19,526 (17.7)	8,368 (24.8)	15,557 (24.8)
70-79	25,892 (16.9)	17,807 (16.2)	4,763 (14.1)	7,897 (12.6)
80-	11,635 (7.6)	13,000 (11.8)	1,597 (4.7)	2,565 (4.1)
Total	153,604 (100)	110,123 (100)	33,789 (100)	62,829 (100)
Mean (SD)	55.6 (18.0)	54.9 (20.3)	54.9 (16.4)	54.9 (15.4)

Supplementary Table S1 -- continued

a Patients with both of diagnosis codes of psoriasis and PPP are classified as those with psoriasis.

b Patients with at least one claim with diagnosis code of psoriasis or PPP where the department was specified as dermatology or rheumatology during the 12-month observation period.

c Patients with a diagnosis code of psoriasis or PPP where the department was specified as that other specialty but not as dermatology or rheumatology.

d Patients with a diagnosis code of psoriasis or PPP where the department was not specified.

PPP, palmoplantar pustulosis.

Supplementary Table S2

Diagnosis codes of psoriasis and PPP classified by the department specified in a claim in Japanese National Database

	Department Specified				Not specified [e]	All patients
	Derma [a]	Rheuma [b]	Derma/ rheuma [c]	Other specialty [d]		
	N [f] (%)	N [f] (%)	N [f] (%)	N [f] (%)	N [f] (%)	N [f] (%)
Psoriasis	130,953 (100)	2,301 (100)	132,189 (100)	33,763 (100)	263,727 (100)	429,679 (100)
Plaque psoriasis	127,170 (97.1)	1,602 (69.6)	127,822 (96.7)	30,808 (96.5)	260,075 (98.6)	418,705 (97.4)
Psoriasis vulgaris	103,573 (79.1)	1,161 (50.5)	104,002 (78.7)	20,202 (59.8)	214,621 (81.4)	338,825 (78.9)
Psoriasis	20,972 (16.0)	528 (22.9)	21,231 (16.1)	11,159 (33.1)	44,821 (17.0)	77,302 (18.0)
Psoriasis vulgaris of entire body	7,262 (5.5)	66 (2.9)	7,267 (5.5)	579 (1.7)	2,030 (0.8)	9,876 (2.3)
Psoriasis of extremities	387 (0.3)	---[g]	390 (0.3)	99 (0.3)	411 (0.2)	900 (0.2)
Psoriasis vulgaris of extremities	3,210 (2.5)	24 (1.0)	3,214 (2.4)	371 (1.1)	2,417 (0.9)	6,002 (1.4)
Psoriasis vulgaris of lower back	144 (0.1)	---[g]	144 (0.1)	38 (0.1)	74 (0.03)	256 (0.1)
Plaque psoriasis	70 (0.1)	---[g]	70 (0.1)	11 (0.03)	33 (0.01)	114 (0.03)

Supplementary Table S2 ---continued

	Department					All patients
	Specified				Not specified [e]	
	Derma [a]	Rheuma [b]	Derma/ rheuma [c]	Other specialty [d]		
	N [f] (%)	N [f] (%)	N [f] (%)	N [f] (%)	N [f] (%)	N [f] (%)
Scalp psoriasis	1,177 (0.9)	--- [g]	1,180 (0.9)	257 (0.8)	1,395 (0.5)	2,832 (0.7)
Seborrheic psoriasis [h]	123 (0.1)	--- [g]	123 (0.1)	118 (0.3)	350 (0.1)	591 (0.1)
Psoriasis vulgaris of scalp	1,055 (0.8)	--- [g]	1,058 (0.8)	140 (0.4)	1,046 (0.4)	2,244 (0.5)
Guttate psoriasis	1,241 (0.9)	--- [g]	1,242 (0.9)	137 (0.4)	1,193 (0.5)	2,572 (0.6)
Psoriatic arthritis	3,774 (2.9)	1,210 (52.6)	4,530 (3.4)	2,128 (6.3)	1,702 (0.6)	8,360 (1.9)
Psoriatic arthritis	3,686 (2.8)	960 (41.7)	4,206 (3.2)	1,529 (4.5)	1,410 (0.5)	7,145 (1.7)
Psoriatic arthritis mutilans [i]	63 (0.05)	244 (10.6)	292 (0.2)	575 (1.7)	272 (0.1)	1,139 (0.3)
Psoriatic spondylitis	82 (0.1)	24 (1.0)	93 (0.1)	45 (0.1)	25 (0.01)	163 (0.04)
Pustular psoriasis	2,941 (2.2)	67 (2.9)	2,953 (2.2)	409 (1.2)	1,274 (0.5)	4,636 (1.1)
Pustular psoriasis	2,595 (2.0)	62 (2.7)	2,606 (2.0)	238 (0.7)	822 (0.3)	3,666 (0.9)
Impetigo herpetiformis [j]	128 (0.1)	--- [g]	128 (0.1)	160 (0.5)	255 (0.1)	543 (0.1)

Supplementary Table S2 ---continued

	Department					All patients
	Specified				Not specified [e]	
	Derma [a]	Rheuma [b]	Derma/ rheuma [c]	Other specialty [d]		
	N [f] (%)	N [f] (%)	N [f] (%)	N [f] (%)	N [f] (%)	N [f] (%)
Acrodermatitis continua	242 (0.2)	--- [g]	243 (0.2)	12 (0.04)	199 (0.1)	454 (0.1)
Generalized pustular psoriasis	28 (0.02)	--- [g]	28 (0.02)	--- [g]	--- [g]	32 (0.01)
Acute generalized pustular Psoriasis	--- [g]	--- [g]	--- [g]	--- [g]	--- [g]	--- [g]
Erythrodermic psoriasis	1,045 (0.8)	35 (1.5)	1,057 (0.8)	223 (0.7)	330 (0.1)	1610 (0.4)
PPP	6,170 (4.7)	82 (3.6)	6,194 (4.7)	811 (2.4)	5,620 (2.1)	12,625 (2.9)
PAO [k]	173 (0.1)	21 (0.9)	180 (0.1)	73 (0.2)	146 (0.1)	401 (0.1)
PPP	26,928 (100)	435 (100)	27,195 (100)	12,411 (100)	96,618 (100)	136,224 (100)
PPP	26.880 (99.8)	394 (90.6)	27,109 (99.7)	11,979 (96.5)	96,559 (99.9)	135,647 (99.6)
PAO [l]	689 (2.6)	112 (25.7)	762 (2.8)	3,268 (26.3)	1,704 (1.8)	5,734 (4.2)

Supplementary Table S2 -- continued

a Patients with at least one claim with a diagnosis code of psoriasis or PPP where the department was specified as dermatology during the 12-month observation period.
b Patients with at least one claim where the department was specified as rheumatology.
c Patients with at least one claim where the department was specified as dermatology or rheumatology (department subgroup A).
d Patients with any claim where the department was specified as other specialty but not dermatology or rheumatology (department subgroup B).
e Patients with claims where the department was not specified (department subgroup C).
f One patient is counted once for each code and for subclass of diagnosis and therefore sum of lower categories may exceed a total of upper category.
g Less than 10 patients were found.
h "Internal medicine" was specified for 68 (58%) of 118 patients with "Seborrheic psoriasis" in the department of other specialty.
i "Orthopedics" was specified for 470 (82%) of 575 patients with "Psoriatic arthritis mutilans" in the department of other specialty.
j "Internal medicine" was specified for 61 (38%) of 160 patients with "Impetigo herpetiformis" in the department of other specialty.
k "Internal medicine" was specified for 54 (74%) of 73 patients with "PAO" in the department of other specialty under the broad disease category of psoriasis.
l "Internal medicine" was specified for 2978 (91%) of 3268 patients with "PAO" in the department of other specialty under the broad disease category of PPP.
PPP, palmoplantar pustulosis; PAO, pustulotic arthro-osteitis.

Supplementary Table S3

Use of healthcare service in each of 12 months during the study period in patients with psoriasis and PPP subdivided by the department in a claim with diagnosis code of psoriasis and PPP in Japanese National Database

	All		Dermatology or rheumatology (subgroup A)		Other specialty (subgroup B)		Department not specified (subgroup C)	
Year and Month	N [b]	%	N [b]	%	N [b]	%	N [b]	%
Patients with Psoriasis								
2010 April	155,927	36.3	57,385	43.4	15,271	45.2	83,271	31.6
2010 May	157,238	36.6	57,029	43.1	14,884	44.1	85,325	32.4
2010 June	166,483	38.7	59,989	45.4	15,409	45.6	91,085	34.5
2010 July	168,831	39.3	60,186	45.5	15,495	45.9	93,150	35.3
2010 August	161,494	37.6	59,172	44.8	14,974	44.4	87,348	33.1
2010 September	162,322	37.8	59,257	44.8	15,182	45.0	87,883	33.3
2010 October	167,886	39.1	59,960	45.4	15,148	44.9	92,778	35.2
2010 November	168,288	39.2	60,074	45.4	15,295	45.3	92,919	35.2
2010 December	176,910	41.2	62,093	47.0	15,562	46.1	99,255	37.6
2011 January	164,580	38.3	59,920	45.3	15,067	44.6	89,593	34.0
2011 February	165,743	38.6	58,425	44.2	14,937	44.2	92,381	35.0
2011 March	177,900	41.4	62,591	47.3	15,968	47.3	99,341	37.7
Total	429,679	100.0	132,189	100.0	33,763	100.0	263,727	100.0

Supplementary Table S3 -- continued

Year and Month	All N [b]	All %	Dermatology or rheumatology (subgroup A) N [b]	Dermatology or rheumatology (subgroup A) %	Other specialty (subgroup B) N [b]	Other specialty (subgroup B) %	Department not specified (subgroup C) N [b]	Department not specified (subgroup C) %
Patients with PPP								
2010 April	41,825	30.7	9,388	34.5	4,747	38.2	27,690	28.7
2010 May	45,888	33.7	9,912	36.4	4,523	36.4	31,453	32.6
2010 June	52,193	38.3	11,172	41.1	5,045	40.6	35,976	37.2
2010 July	55,463	40.7	11,508	42.3	5,126	41.3	38,829	10.2
2010 August	52,850	38.8	11,329	41.7	4,903	39.5	36,618	37.9
2010 September	52,649	38.6	11,375	41.8	5,065	40.8	36,209	37.5
2010 October	52,229	38.3	11,193	41.2	4,988	40.2	36,048	37.3
2010 November	48,962	35.9	10,464	38.5	4,753	38.3	33,745	34.9
2010 December	49,679	36.5	10,606	39.0	4,757	38.3	34,316	35.5
2011 January	43,971	32.3	9,801	36.0	4,432	35.7	29,738	30.8
2011 February	44,373	32.6	9,603	35.3	4,461	35.9	30,309	31.4
2011 March	47,678	35.0	10,289	37.8	4,716	38.0	32,673	33.8
Total	136,224	100.0	27,195	100.0	12,411	100.0	96,618	100.0

a Patients with at least one claim with diagnosis code of psoriasis or PPP where the department was specified as either dermatology or rheumatology ("Dermatology or rheumatology") or other specialty but not dermatology or rheumatology ("Other specialty") during the 12-month observation period.

b Number of patients with a claim with a diagnosis code of psoriasis or PPP.

PPP, palmoplantar pustulosis.

Supplementary Table S4

Seasonal variation of use of healthcare service in patients with a diagnosis code of psoriasis and PPP in Japanese National Database

Use of health-care service					
2010 July or August	2011 January or February	Psoriasis N [a]	%	PPP N [a]	%
All patients					
Yes	Yes	147,254	34.3	41,153	30.2
Yes	No	78,956	18.4	34,229	25.1
No	Yes	80,384	18.7	20,548	15.1
No	No	123,085	28.6	40,294	29.6
Total		429,679	100.0	136,224	100.0
Difference (95% CI) [b]		-0.33% (-0.51 to -0.15%)		10.0% (9.8 to 10.3%)	
P value [c]		0.0004		<0.0001	
Patients of dermatology or rheumatology (subgroup A) [d]					
Yes	Yes	58,962	44.6	9,905	36.4
Yes	No	22,384	16.9	6,267	23.0
No	Yes	22,328	16.9	4,164	15.3
No	No	28,515	21.6	6,859	25.2
Total		132,189	100.0	27,195	100.0
Difference (95% CI) [b]		0.04% (-0.27 to 0.36%)		7.7% (7.1 to 8.4%)	
P value [c]		0.79		<0.0001	
Patients of department of other specialty (subgroup B) [e]					
Yes	Yes	14,223	42.1	4,596	37.0
Yes	No	5,714	16.9	2,615	21.1
No	Yes	5,497	16.3	1,790	14.4
No	No	8,329	24.7	3,410	27.5
Total		33,763	100.0	12,411	100.0
Difference (95% CI) [b]		0.64% (0.03 to 1.25%)		6.6% (5.7 to 7.6%)	
P value [c]		0.04		<0.0001	

Supplementary Table S4 --- continued

Use of health-care service					
2010 July or August	2011 January or February	Psoriasis N [a]	%	PPP N [a]	%
Patients of department not specified (subgroup C) [f]					
Yes	Yes	74,069	32.7	26,652	27.6
Yes	No	50,858	19.9	25,347	26.2
No	Yes	52,559	19.3	14,594	15.1
No	No	86,241	28.0	30,025	31.1
Total		263,727	100.0	96,618	100.0
Difference (95% CI) [b]		-0.64% (-0.88 to -0.40%)		11.1% (10.8 to 11.5%)	
P value [b]		<0.0001		<0.0001	

a Number of patients with a claim with a diagnosis code of psoriasis or PPP.

b Difference between the proportion of patients who used the healthcare service in the hottest season (July or August 2010) and the proportion of patients who used the service in the coldest season (January or February of 2011).

c The result of paired t-test is shown.

d Patients with at least one claim with diagnosis code of psoriasis or PPP where the department was specified as dermatology or rheumatology during the 12-month observation period.

e Patients with a diagnosis code of psoriasis or PPP where the department was specified as other specialty but not as dermatology or rheumatology.

f Patients with a diagnosis code of psoriasis or PPP where the department was not specified.

PPP, palmoplantar pustulosis.

Supplementary Table S5

Treatments for psoriasis and PPP subdivided by the department specified in a claim with a diagnosis code of psoriasis and PPP in Japanese National Database

	Psoriasis				PPP			
		Male		Psoriatic arthritis		Male		PAO
	N [a] (%)	N (%)	Age (SD)	N (%)	N [a] (%)	N (%)	Age (SD)	N (%)
All patients								
	N=429,679				N=136,224			
Systemic therapy								
Biologics	3,291 (0.8)	2,132 (64.8)	48.9 (14.1)	1,111 (33.8)	253 (0.2)	65 (25.7)	53.2 (13.6)	20 (7.9)
Methotrexate	1,680 (0.4)	1,072 (63.8)	52.0 (15.5)	480 (28.6)	174 (0.1)	53 (30.5)	54.6 (13.4)	19 (10.9)
Ciclosporin	21,997 (5.1)	13,813 (62.8)	53.2 (16.2)	1,604 (7.3)	251 (0.2)	98 (39.0)	52.9 (13.8)	20 (8.0)
Etretinate	15,481 (3.6)	11,025 (71.2)	60.1 (13.6)	609 (3.9)	1,950 (1.4)	725 (37.2)	57.5 (11.7)	35 (1.8)
Phototherapy	21,005 (4.9)	12,370 (58.9)	54.6 (18.1)	309 (1.5)	10,408 (7.6)	3,657 (35.1)	53.3 (15.0)	156 (1.5)
Topical therapy								
Topical vitamin D	256,122 (59.6)	156,050 (60.9)	53.4 (18.5)	3,698 (1.4)	42,903 (31.5)	14,276 (33.3)	53.0 (14.9)	612 (1.4)
Topical corticosteroid	349,568 (81.4)	211,744 (60.6)	54.9 (18.1)	5,323 (1.5)	109,692 (80.5)	37,881 (34.5)	53.4 (15.3)	3,576 (3.3)
No treatment	38,224 (8.9)	19,393 (50.7)	58.6 (19.5)	1,851 (4.8)	21,209 (15.6)	7,527 (35.5)	54.6 (16.2)	2,083 (9.8)

Supplementary Table S5 --- continued

	Psoriasis				PPP			
		Male		Psoriatic arthritis		Male		PAO
	N [a] (%)	N (%)	Age (SD)	N (%)	N [a] (%)	N (%)	Age (SD)	N (%)
Patients of dermatology or rheumatology (subgroup A) [b]								
	N=132,189				N=27,195			
Systemic therapy								
Biologics	2,674 (2.0)	1,827 (68.3)	48.4 (13.8)	895 (33.5)	112 (0.4)	28 (25.0)	54.5 (11.9)	--[c]
Methotrexate	681 (0.5)	436 (64.0)	51.1 (15.6)	280 (41.1)	67 (0.2)	14 (20.9)	51.8 (13.0)	13 (19.4)
Ciclosporin	12,330 (9.3)	7,917 (64.2)	52.8 (15.8)	1,023 (8.3)	109 (0.4)	37 (33.9)	54.4 (11.9)	--[c]
Etretinate	9,010 (6.8)	6,387 (70.9)	60.6 (13.5)	501 (5.6)	744 (2.7)	271 (36.4)	57.4 (10.7)	26 (3.5)
Phototherapy	5,465 (4.1)	3,352 (61.3)	56.4 (16.9)	181 (3.3)	1,529 (5.6)	498 (32.6)	53.9 (14.2)	43 (2.8)
Topical therapy								
Topical vitamin D	86,201 (65.2)	54,802 (63.6)	55.9 (17.7)	2,736 (3.2)	11,194 (41.2)	3,737 (33.4)	54.9 (14.0)	365 (3.3)
Topical corticosteroid	112,813 (85.3)	70,655 (62.6)	56.8 (17.3)	3,580 (3.2)	23,415 (86.1)	8,006 (34.2)	55.3 (14.3)	623 (2.7)
No treatment	7,621 (5.8)	3,809 (50.0)	54.8 (19.7)	448 (5.9)	2,732 (10.0)	941 (34.4)	55.3 (14.5)	114 (4.2)

Supplementary Table S5 --- continued

	Psoriasis				PPP			
		Male		Psoriatic arthritis		Male		PAO
	N [a] (%)	N (%)	Age (SD)	N (%)	N [a] (%)	N (%)	Age (SD)	N (%)
Patients of department other specialty (subgroup B) [d]								
	N=33,763				N=12,411			
Systemic therapy								
Biologics	294 (0.9)	163 (55.4)	49.5 (15.0)	155 (52.7)	51 (0.4)	12 (23.5)	51.9 (11.8)	11 (21.6)
Methotrexate	265 (0.8)	146 (55.1)	50.3 (16.3)	133 (50.2)	38 (0.3)	15 (39.5)	56.7 (11.9)	--[c]
Ciclosporin	2,474 (7.3)	1,247 (50.4)	57.5 (16.0)	350 (14.1)	38 (0.3)	13 (34.2)	54.1 (16.2)	10 (26.3)
Etretinate	650 (1.9)	462 (71.1)	63.3 (13.5)	27 (4.2)	72 (0.6)	21 (29.2)	57.1 (11.8)	--[c]
Phototherapy	689 (2.0)	415 (60.2)	61.0 (16.7)	36 (5.2)	386 (3.1)	135 (35.0)	54.1 (14.8)	74 (19.2)
Topical therapy								
Topical vitamin D	11,608 (34.4)	7,379 (63.6)	58.6 (17.3)	391 (3.4)	1,832 (14.8)	579 (31.6)	54.3 (14.7)	153 (8.4)
Topical corticosteroid	19,804 (58.7)	12,008 (60.6)	59.1 (18.4)	869 (4.4)	7,037 (56.7)	2,304 (32.7)	54.1 (15.7)	1,858 (26.4)
No treatment	9,906 (29.3)	5,121 (51.7)	62.1 (17.0)	921 (9.3)	5,005 (40.3)	1,735 (34.7)	55.9 (14.9)	1,391 (27.8)

Supplementary Table S5 --- continued

	Psoriasis				PPP			
		Male		Psoriatic arthritis		Male		PAO
	N [a] (%)	N (%)	Age (SD)	N (%)	N [a] (%)	N (%)	Age (SD)	N (%)
Patients of department not specified (subgroup C) [e]								
	N=263,727				N=96,618			
Systemic therapy								
Biologics	323 (0.1)	142 (44.0)	52.5 (15.0)	61 (18.9)	90 (0.1)	25 (27.8)	52.3 (16.3)	--[c]
Methotrexate	734 (0.3)	490 (66.8)	53.5 (15.0)	67 (9.1)	69 (0.1)	24 (34.8)	56.2 (14.3)	--[c]
Ciclosporin	7,193 (2.7)	4,649 (64.6)	52.4 (16.7)	231 (3.2)	104 (0.1)	48 (46.2)	50.8 (14.5)	--[c]
Etretinate	5,821 (2.2)	4,176 (71.7)	59.0 (13.6)	81 (1.4)	1,134 (1.2)	433 (38.2)	57.6 (12.4)	--[c]
Phototherapy	14,851 (5.6)	8,603 (57.9)	53.6 (18.5)	92 (0.6)	8,493 (8.8)	3,024 (35.6)	53.1 (15.1)	39 (0.5)
Topical therapy								
Topical vitamin D	158,313 (60.0)	93,869 (59.3)	51.6 (18.8)	571 (0.4)	29,877 (30.9)	9,960 (33.3)	52.2 (15.1)	94 (0.3)
Topical corticosteroid	216,951 (82.3)	129,081 (59.5)	53.5 (18.3)	874 (0.4)	79,240 (82.0)	27,571 (34.8)	52.8 (15.4)	1,095 (1.4)
No treatment	20,697 (7.8)	10,463 (50.6)	58.3 (20.3)	482 (2.3)	13,472 (13.9)	4,851 (36.0)	53.9 (16.9)	578 (4.3)

Supplementary Table S5 -- continued

a One patient is counted once for each treatment.

b Patients with at least one claim with a diagnosis code of psoriasis or PPP where the department was specified as dermatology or rheumatology during the 12-month observation period.

c Less than 10 patients had the treatment.

d Patients with a diagnosis code of psoriasis or PPP where the department was specified as other specialty but not as dermatology or rheumatology.

e Patients with a diagnosis code of psoriasis or PPP where the department was not specified.

PPP, palmoplantar pustulosis; PAO, pustulotic arthro-osteitis.

Supplementary Table S6

Prevalence of diabetes mellitus, hyperlipidemia and hypertension in severity classes I to IV of patients with psoriasis and PPP subdivided by the department specified in the claim in Japanese National Database

	All patients		Patients of dermatol or rheumatol [a] (subgroup A)		Patients of other department [b] (subgroup B)		Patients of department not specified [c] (subgroup C)	
	Psoriasis	PPP	Psoriasis	PPP	Psoriasis	PPP	Psoriasis	PPP
Severity Class I (systemic therapy)								
Total N	39,796	2,588	22,641	1,009	3,520	194	13,635	1,385
Diabetes mellitus								
N [d]	5,271	260	3,121	111	747	21	1,403	128
Prevalence [e] (%)	12.7	9.3	13.2	11.2	19.4	10.9	9.5	7.7
Difference [f] (%)	3.1	0.8	2.1	1.2	5.8	-0.6	1.4	0.3
(95%CI)	(2.7,3.4)	(-0.5,2.1)	(1.6,2.5)	(-1.4,3.9)	(4.5,7.1)	(-5.8,4.6)	(0.9,1.9)	(-1.1,1.8)
Hyperlipidemia								
N [d]	8,208	557	4,725	239	1,003	32	2,480	286
Prevalence [e] (%)	20.7	18.3	21.1	20.2	25.1	15.3	17.6	16.6
Difference [f] (%)	3.2	1.0	2.5	2.0	6.2	-2.7	1.5	0.4
(95%CI)	(2.8,3.6)	(-0.6,2.6)	(1.9,3.1)	(-0.9,5.0)	(4.8,7.7)	(-8.2,2.8)	(0.8,2.1)	(-1.5,2.4)
Hypertension								
N [d]	11,795	576	7,150	230	1,235	38	3,410	308
Prevalence [e] (%)	28.5	22.4	30.5	22.7	30.8	18.9	23.2	21.6
Difference [f] (%)	5.1	0.6	5.9	0.0	3.4	-5.7	1.5	1.1
(95%CI)	(4.7,5.6)	(-1.0,2.3)	(5.3,6.6)	(-3.0,3.0)	(1.9,4.9)	(-11.9,0.5)	(0.8,2.2)	(-1.0,3.2)

Supplementary Table S6 -- continued

	All patients		Patients of dermatol or rheumatol [a] (subgroup A)		Patients of other department [b] (subgroup B)		Patients of department not specified [c] (subgroup C)	
	Psoriasis	PPP	Psoriasis	PPP	Psoriasis	PPP	Psoriasis	PPP
Severity Class II (phototherapy without systemic therapy)								
Total N	18,833	10,153	4,332	1,452	614	379	13,887	8,322
Diabetes mellitus								
N [d]	1,747	686	496	98	89	29	1,162	559
Prevalence [e] (%)	9.0	7.7	13.2	11.2	12.0	9.6	8.0	7.2
Difference [f] (%)	-0.6	-0.8	2.1	1.2	-1.6	-1.8	-0.1	-0.2
(95%CI)	(-1.0,-0.2)	(-1.4,-0.2)	(1.6,2.5)	(-1.4,3.9)	(-4.1,0.8)	(-4.9,1.3)	(-0.6,0.3)	(-0.9,0.5)
Hyperlipidemia								
N [d]	3,125	1,731	811	268	131	71	2,183	1,392
Prevalence [e] (%)	16.7	17.4	21.1	20.2	17.8	16.9	15.5	16.5
Difference [f] (%)	-0.8	0.1	2.5	2.0	-1.0	-1.1	-0.6	0.3
(95%CI)	(-1.3,-0.3)	(-0.7,1.0)	(1.9,3.1)	(-0.9,5.0)	(-3.9,1.9)	(-5.0,2.8)	(-1.2,0.0)	(-0.6,1.2)
Hypertension								
N [d]	4,369	1,885	1,169	281	196	93	3,004	1,511
Prevalence [e] (%)	22.8	21.8	30.5	22.7	23.7	23.6	21.3	20.7
Difference [f] (%)	-0.6	0.0	5.9	0.0	-3.8	-1.0	-0.5	0.3
(95%CI)	(-1.2,-0.1)	(-0.9,0.9)	(5.3,6.6)	(-3.0,3.0)	(-6.6,-0.9)	(-5.2,3.2)	(-1.1,0.2)	(-0.7,1.2)

Supplementary Table 6 -- continued

	All patients		Patients of dermatol or rheumatol [a] (subgroup A)		Patients of other department [b] (subgroup B)		Patients of department not specified [c] (subgroup C)	
	Psoriasis	PPP	Psoriasis	PPP	Psoriasis	PPP	Psoriasis	PPP
Severity Class III (topical therapy only)								
Total N	332,826	102,274	97,595	22,002	19,723	6,833	215,508	73,439
Diabetes mellitus								
N [d]	32,378	7,583	11,886	2,141	2,985	725	17,507	4,717
Prevalence [e] (%)	9.6	8.5	11.1	10.0	13.6	11.5	8.2	7.4
Difference [f] (%)	ref	ref	ref	ref	ref	ref	ref	ref
Hyperlipidemia								
N [d]	56,561	17,783	19,006	4,434	4,206	1,315	33,289	12,034
Prevalence [e] (%)	17.5	17.3	18.6	18.2	18.9	18.0	16.1	16.2
Difference [f] (%)	ref	ref	ref	ref	ref	ref	ref	ref
Hypertension								
N [d]	78,996	19,322	26,307	4,781	6,484	1,548	46,205	12,993
Prevalence [e] (%)	23.4	21.7	24.5	22.7	27.4	24.6	21.7	20.4
Difference [f] (%)	ref	ref	ref	ref	ref	ref	ref	ref

Supplementary Table S6 -- continued

	All patients		Patients of dermatol or rheumatol [a] (subgroup A)		Patients of other department [b] (subgroup B)		Patients of department not specified [c] (subgroup C)	
	Psoriasis	PPP	Psoriasis	PPP	Psoriasis	PPP	Psoriasis	PPP
Severity Class IV (No treatment)								
Total N	38,224	21,209	7,621	2,732	9,906	5,005	20,697	13,472
Diabetes mellitus								
N [d]	4,669	2,061	808	261	1,676	622	2,185	1,178
Prevalence [e] (%)	11.5	10.4	10.6	10.1	15.1	13.0	9.6	9.1
Difference [f] (%)	1.9	2.0	-0.6	0.1	1.5	1.5	1.4	1.7
(95%CI)	(1.6,2.2)	(1.5,2.4)	(-1.3,0.1)	(-1.2,1.5)	(0.6,2.4)	(0.2,2.8)	(1.0,1.8)	(1.2,2.3)
Hyperlipidemia								
N [d]	7,771	4,283	1,318	536	2,340	1,087	4,113	2,660
Prevalence [e] (%)	18.9	18.6	16.7	17.7	19.8	18.6	18.0	17.7
Difference [f] (%)	1.4	1.4	-2.0	-0.4	1.0	0.6	1.9	1.5
(95%CI)	(1.0,1.8)	(0.8,2.0)	(-2.8,-1.1)	(-2.0,1.1)	(0.1,1.9)	(-0.9,2.1)	(1.4,2.4)	(0.8,2.2)
Hypertension								
N [d]	11,061	4,786	1,675	572	3,547	1,293	5,839	2,921
Prevalence [e] (%)	25.5	23.9	21.2	21.8	28.6	25.6	24.0	22.4
Difference [f] (%)	2.1	2.1	-3.4	-0.9	1.2	1.0	2.3	2.0
(95%CI)	(1.7,2.6)	(1.5,2.8)	(-4.3,-2.5)	(-2.6,0.9)	(0.2,2.2)	(-0.6,2.5)	(1.7,2.8)	(1.2,2.8)

Supplementary Table S6 -- continued

a Patients with at least one claim with a diagnosis code of psoriasis or PPP where the department was specified as dermatology or rheumatology during the 12-month observation period.

b Patients with a diagnosis code of psoriasis or PPP where the department was specified as other specialty but not as dermatology or rheumatology.

c Patients with diagnosis code of psoriasis or PPP where the department was not specified.

d Number of patients with a diagnosis code of the concurrent disease (diabetes mellitus, hyperlipidemia or hypertension) at least in one claim as well as a drug to treat the concurrent disease in the claims issued in 2 or more different months.

e Prevalence was standardized to the distribution of age and sex in the entire study population of 565,903 subjects as in Table 4 in the text.

f Difference of the standardized prevalence between the severity classes I, II and IV and the severity class III (topical treatment only) in each department subgroup.

PPP, palmoplantar pustulosis; CI, confidence interval.

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract It is indicated that the study is a nationwide study using database though the term "cross-sectional" itself is not used
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found In the abstract, the study is summarized in an informative and balanced way.
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported Epidemiology of psoriasis/ palmoplantar pusutulosis (PPP) in the Western countries and Asia are outlined and the current status of the secondary use of National Database in Japan is mentioned.
Objectives	3	State specific objectives, including any prespecified hypotheses This study is descriptive and the objective "to study national prevalence of psoriasis and PPP" is given clearly.
Methods		
Study design	4	Present key elements of study design early in the paper It is given that we did a descriptive study using database covering whole nation
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection It is given that data for 12-month period (with specified dates) was extracted from Japanese national database to obtain data of patients with psoriasis/PPP.
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants It is given that all the patients were identified by the ICD-10 diagnosis code.
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable This is the descriptive study and all the attributes of the patients examined including age, sex, use of health care service, treatments for psoriasis/PPP, comorbidities are specified.
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group All the data were obtained from the database and codes for diagnoses, drugs and other treatments used in the study are specified.
Bias	9	Describe any efforts to address potential sources of bias One of major possible biases is misclassification of psoriasis/PPP particularly when the diagnosis was made by non-specialist. It is given that we collected the specialty of the department in a claim with a diagnosis code of psoriasis and PPP issued from a hospital or clinic.
Study size	10	Explain how the study size was arrived at We did not give sample size calculation as this is the descriptive study to estimate national prevalence of psoriasis/PPP using database covering the whole nation.
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why

		We gave how quantitative variables were handled clearly in the section of statistical analysis including subgroups used in the study.
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding In the comparison of comorbidities between subclasses according to severity, in the supplementary tables, we stratified the data by the specialty of the department. It is also clearly given that we used McNemar test to examine the seasonal variation of the use of health care service.
		(*b*) Describe any methods used to examine subgroups and interactions It is given that we examined subgroups classified by the specialty of the department.
		(*c*) Explain how missing data were addressed In this study using the national database, no information is available suggesting potential missing variables and the issue of missing data is not addressed.
		(*d*) If applicable, describe analytical methods taking account of sampling strategy The study is to cover the whole nation and this issue is not applicable.
		(*e*) Describe any sensitivity analyses In this descriptive study, no sensitivity analysis is conducted.
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed In this study using national database, there was no "stage" which might be seen in the study using the primary data.
		(b) Give reasons for non-participation at each stage In this database study, no non-participation occurred.
		(c) Consider use of a flow diagram Due to the nature of the study, we did not judge it is needed to use a flow diagram.
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders We gave the basic characteristics in Table 1 and Figure 1.
		(b) Indicate number of participants with missing data for each variable of interest In this study, no information is available suggesting potential missing variables and we could not show the number of subjects with missing data.
Outcome data	15*	Report numbers of outcome events or summary measures Though this study is descriptive, comorbidity may be regarded as one of "outcomes" and the number is summarized in Table 4.
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included Estimates of the proportion are given with 95% confidence interval. As "confounding" is not an issue in this study, no data after "adjustment" is shown though we showed results when stratified by the specialty of the department and other variables used to make subclasses.
		(*b*) Report category boundaries when continuous variables were categorized This occurred for age which was given as 5-year age band and the boundaries are clearly given in the manuscript.
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period

		In this descriptive study, this issue of relative/absolute risk is not relevant.
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses In supplementary tables, the results in subgroups subdivided by the specialty of the department with or without further stratification by the additional variable (e.g., severity of disease) are shown.
Discussion		
Key results	18	Summarise key results with reference to study objectives Main result or prevalence of psoriasis/PPP is summarized.
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias Main limitation due to the lack of validation study is emphasized.
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence Interpretation is made cautiously particularly we recognize that the study has limitations. Comparison with other studies so far conducted is made.
Generalisability	21	Discuss the generalisability (external validity) of the study results As the study used the data covering whole nation, generalizability is not an issue.
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based The source of funding and the role of the funders is clearly given in the section of "Funding" given after REFERENCES.

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Epidemiology of psoriasis and palmoplantar pustulosis: a nationwide study using the Japanese national claims database

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Epidemiology of psoriasis and palmoplantar pustulosis: a nationwide study using the Japanese national claims database

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ABSTRACT

Objective: The primary objective is to estimate the national prevalence of psoriasis and palmoplantar pustulosis (PPP) in Japan. Secondary objectives are to know (1) whether the disease activity of psoriasis and PPP varies seasonally, and (2) whether the disease severity is associated with concurrent diabetes mellitus, hyperlipidemia and hypertension.

Settings: Patients with a diagnosis code of psoriasis or PPP were identified using Japanese national database between April 2010 and March 2011.

Participants: A total of 565,903 patients with psoriasis or PPP were identified. No patient was excluded.

Primary and Secondary Outcome Measures: The national prevalence was calculated using the census data. We estimated the difference of proportion of patients who used healthcare service, as a proxy of disease activity, between hot and cold seasons and that of standardized prevalence of comorbidities between severe and mild diseases. The measures were finally estimated in two broad disease categories of psoriasis and PPP separately but not in all patients as planned because two disease categories were different for major aspects.

Results: The national prevalence of psoriasis and PPP was 0.34% (95% CI 0.34 to 0.34%) and 0.12% (0.12 to 0.12%), respectively. The difference of the proportion of patients who used healthcare service in the hottest and coldest seasons was -0.3% (-0.5 to -0.1%) for psoriasis and 10.0% (9.8 to 10.3%) for PPP. The difference of the standardized prevalence between severe and mild psoriasis was 3.1% (2.7 to 3.4%), 3.2% (2.8 to 3.6%) and 5.1% (4.7 to 5.6%) for concurrent diabetes mellitus, hyperlipidemia and hypertension, respectively. No significant difference of the prevalence of comorbidity

was observed for PPP.

Conclusions: The national prevalence, seasonal variation of disease activity and prevalence of comorbidities in Japanese patients with psoriasis and PPP estimated in this descriptive study may be used as the basic information in the future studies.

Strengths and limitations of this study

- This study estimated the national prevalence of psoriasis and palmoplantar pustulosis (PPP) using the national database covering more than 90% of the whole Japanese population.
- The seasonal variation of the use of the healthcare service, as a proxy of disease activity, treatments for psoriasis and PPP and the prevalence of concurrent diabetes mellitus, hyperlipidemia and hypertension are also examined.
- The main limitation of the current study is that the diagnosis codes of psoriasis and PPP are not validated.
- To address the concern for possible misclassification of psoriasis and PPP by the non-specialist, results in the subgroups divided by the specialty of the department that provided the healthcare service are shown in online supplementary tables.

INTRODUCTION

Psoriasis is a chronic immune-mediated disease affecting 2-4% of population in the US and Europe ,[1-3]. However, according to the recent epidemiological studies, the prevalence of psoriasis in Asian countries is lower than that in the Western countries ,[4,5]. Palmoplantar pustulosis (PPP), first described as a variant of pustular psoriasis ,[6], has been regarded as a rare disease in the Western countries ,[7] but its prevalence in Asia is not known.

Databases including claims databases have been sometimes used to study epidemiology of diseases including psoriasis ,[1,4]. Japanese universal multi-payer health-care system covering virtually all citizens was started already in 1961 but it was only recently that the Japanese national database of health insurance claims (JNDB) was created by the Ministry of Health, Labour and Welfare. The JNDB has accumulated data of all claims in electronic format issued in April 2009 or later. Since 2011, the JNDB was made available on a trial basis for the research and other secondary purposes. In the current descriptive epidemiological study, we used the JNDB data to estimate the national prevalence and some of relevant epidemiological characteristics including seasonal variation of the use of the healthcare service ,[8] of psoriasis and PPP in Japanese population.

MATERIALS AND METHODS

Acquisition of claims data

All the patients with diagnosis codes of psoriasis and PPP in outpatient or inpatient claims issued in electronic format between April 2010 and March 2011 were identified. The proportion of claims in electronic format was 97.9 and 99.6 % for claims issued from hospitals, 76.0 and 91.2% for those from clinics and 99.9 and 99.9% for those from community pharmacies in April 2010 and in March 2011, respectively. For claims from clinics, 89.5% were in electronic format already in August 2010 ,[9]. We selected all of the standardized domestic diagnosis codes mapped to L400 to L409 of the 10th revision of the International Statistical Classification of Diseases (ICD-10) in the master table of diagnosis codes for claims in electronic format maintained by the Medical Information System Development Center, Tokyo, Japan. In the provided data, a pair of two kinds of identifiers (defined as ID1 and ID2) was given to all the claims of each patient. Those identifiers were newly created in the JNDB because the social security number or other unique identifier is not used in Japanese healthcare system. Of these two, ID1 was generated by encrypting the combination of health card number given by each insurer, date of birth and sex and ID2 was generated by encrypting the combination of name, date of birth and sex. The former (ID1) may be useful to identify the subject when the patient's family name is changed (e.g., from the maiden to married name) while the latter (ID2) may be useful to identify the patient when the subject becomes insured by a different insurer (e.g., due to job change). Regarding the demographic data, sex and age group of 5-year interval (0-4, 5-9, ---, 80-84, and 85 years of age or older) were provided. We obtained diagnosis codes of concurrent diabetes mellitus, hyperlipidemia and hypertension and codes of drugs to treat those 3 comorbidities as well as drugs and

phototherapy for the treatment of psoriasis and PPP. In Japanese health insurance system, for patients who used the healthcare service, one outpatient claim and/or one inpatient claim from one hospital or clinic are issued for one patient in each month. Similarly, one claim from one community pharmacy is issued for one patient in each month. We obtained the information of year and month of the claims issued for the study subjects together with codes of diagnoses and treatments used in the study. We have also collected the specialty of the department in a claim with a diagnosis code of psoriasis and PPP issued from a hospital or clinic though this information is not a required condition for the reimbursement and often not available.

The study was approved by the ethics committee of the Graduate School and Faculty of Medicine, University of Tokyo in October 2011 (No. 3586).

Statistical Analysis

The prevalence of psoriasis and PPP in the nation were estimated by the counts of patients with a diagnosis code of psoriasis and PPP divided by the population size in the census as of October 2010. The normal approximation confidence interval (CI) of the prevalence was also estimated. A total of 21 local diagnosis codes were classified into the following 8 disease subclasses: (1) plaque psoriasis ("psoriasis vulgaris" (L400), "psoriasis" (L409), "psoriasis vulgaris of entire body" (L400), "psoriasis of extremities" (L400), "psoriasis vulgaris of extremities" (L400), "psoriasis vulgaris of lower back" (L400) and "plaque psoriasis" (L400)), (2) scalp psoriasis ("seborrheic psoriasis" (L400) and "psoriasis vulgaris of scalp" (L400)), (3) guttate psoriasis (L404), (4) psoriatic arthritis ("psoriatic arthritis" (L405), "psoriatic arthritis mutilans" (L405) and "psoriatic spondylitis" (L405)), (5) pustular psoriasis ("pustular psoriasis" (L401), "impetigo

herpetiformis" (L401), "acrodermatitis continua" (L402), "generalized pustular psoriasis" (L401) and "acute generalized pustular psoriasis" (L401)), (6) erythrodermic psoriasis (L408), (7) PPP (L403) and (8) pustulotic arthro-osteitis (PAO) (L403). Patients were further broadly classified into "patients with PPP" when they had a diagnosis code of PPP or PAO but no other diagnosis code. Otherwise, patients were classified into "patients with psoriasis". These two broad disease categories were used on an ad hoc basis because the number of patients with PPP was much larger than expected and patients under two disease categories were found to be different for several important aspects. When the average age was calculated, we used the midpoint of the 5-year interval (e.g., 37 years old for age group 35-39).

To estimate the seasonal variation of the use of the healthcare service for psoriasis and PPP, as a proxy for disease activity, we counted the number of patients in each month during the 12-month observation period for whom an outpatient or inpatient claim with a diagnosis code of psoriasis or PPP was issued. Patients were then divided into 4 groups according to the combination of two dummy variables, X and Y, where the values were assigned as follows: X=1 if the patient used the healthcare service for psoriasis or PPP in the hottest season (July or August of 2010) while X=0 otherwise, and, Y=1 if the patient used the service in the coldest season (January or February of 2011) while Y=0 otherwise. We estimated the difference (and its 95% confidence interval) between the mean of X (the proportion of patients who used the service in the hottest season) and the mean of Y (the proportion of patients who used the service in the coldest season) and the difference was tested by the paired t-test.

Treatments for psoriasis and PPP were classified as systemic therapy (adalimumab, infliximab, ustekinumab, methotrexate, ciclosporin and etretinate), phototherapy and

topical therapy (topical vitamin D and topical corticosteroid). To know the distribution of treatments for psoriasis and PPP, one patient was counted once for each treatment and the proportion of males and the average age were calculated for each treatment group. In addition, for each therapy, the proportion of patients with psoriatic arthropathy in the broad category of psoriasis and that with PAO in the broad category of PPP was calculated to know which treatment was preferred for patients with arthropathy.

To examine whether the concurrent diabetes mellitus, hyperlipidemia and hypertension are more frequent in the patients with severe psoriasis and PPP, the treatment for psoriasis and PPP was used as a surrogate of the severity of psoriasis and PPP. Patients were subdivided into the following severity classes I to IV: patients with one or more of systemic therapies (Class I), patients with phototherapy but no systemic therapy (Class II), patients with topical therapy only (Class III) and patients with no treatment for psoriasis or PPP (Class IV). Patients were defined to have diabetes mellitus when they had a diagnosis code of diabetes mellitus at least in one claim as well as codes of anti-diabetic drugs in claims issued in two or more different months during the 12-month observation period. Similarly, patients were defined to have hyperlipidemia and hypertension, respectively, when they had a diagnosis code of the disease at least in one claim as well as codes of drugs to treat the disease (i.e., lipid-lowering drugs and anti-hypertensive drugs, respectively) in claims issued in two or more months. The prevalence of diabetes mellitus, hyperlipidemia and hypertension in each severity class of psoriasis and PPP was standardized to the distribution of age and sex in the entire study population. The difference of the standardized prevalence and its 95% CI were estimated using the severity class III as a

reference. The standard textbook ,[10] was used to calculate the difference of the standardized prevalence and its 95% CI (equation [15-4] and "parallel formula" to equation [15-10], respectively in reference 10).

To assess who provided the healthcare service, we obtained the specialty of the department specified in a claim with a diagnosis code of psoriasis and PPP. Patients were subdivided into the following 3 department subgroups: (A) "patients of dermatology or rheumatology" when the department was specified as either of dermatology and rheumatology at least in one claim with a diagnosis code of psoriasis or PPP, (B) "patients of other specialty" when the department was specified as other specialty at least in one claim but not as dermatology or rheumatology in any claim and (C) "patients of the department not specified" when the department was not specified in any claim. Demographic and other characteristics of patients with psoriasis and PPP examined in each of 3 department subgroups were shown in online supplementary tables.

All the statistical analyses were conducted by SAS (Version. 9.3, SAS Institute Inc. Cry, NC).

RESULTS

Prevalence and demographic characteristics of psoriasis and PPP

We identified 565,903 patients with psoriasis or PPP from a total of 681,827 ID1s and 778,767 ID2s assuming that all the pairs of ID1 and ID2 represented the same patient when ID1 or ID2 of the pairs was identical. Using the size of the total population (128 million) in the census data as of October 2010, a total number of 565,903 accounted for 0.44% (95% CI 0.44 to 0.44%) of the prevalence in the nation. The 565,903 patients were broadly classified into 429,679 patients with psoriasis (the national prevalence=0.34%, 95% CI 0.34 to 0.34%) and 136,224 patients with PPP. Because 12,663 patients classified under the broad category of psoriasis had a diagnosis code of PPP or PAO as well, 148,887 patients (the national prevalence=0.12%, 95% CI 0.12 to 0.12%) had a diagnosis code of PPP or PAO. Those 12,663 patients with both diagnosis codes of psoriasis and PPP accounted for 2.9% of 429,679 with a diagnosis code of psoriasis and 8.5% of 148,887 with a code of PPP or PAO. Table 1 shows the age-sex distribution of patients with psoriasis and PPP. About 60% were male (male to female ratio=1.44) and the average age was 56.7 years old in patients with psoriasis while about two thirds were female (male to female ratio=0.53) and the average age was 55.5 years old in patients with PPP. Figure 1 shows the national prevalence of psoriasis and PPP in males and females estimated using the census data. For both males and females, the age group 75 to 79 had the highest prevalence in patients with psoriasis while the age group 55 to 59 for females and the age group 60 to 64 for males had the highest prevalence in patients with PPP. In online supplementary table S1, demographic characteristics of patients subdivided into the 3 department subgroups A (dermatology/rheumatology), B (other specialty) and C (not specified) are shown. Of a

total of 429,679 patients with psoriasis, 132,189 (30.8%), 33,763 (7.9%) and 263,727 (61.4%) were classified into subgroups A, B and C, respectively. Of a total of 136,224 patients with PPP, 24,195 (20.0%), 12,411 (9.1%) and 96,618 (70.9%) were classified into subgroups A, B and C, respectively. The male to female ratio was 1.58, 1.33 and 1.39 for psoriasis and 0.52, 0.50 and 0.54 for PPP and the average age was 58.1, 61.8 and 55.3 years old for psoriasis and 57.2, 56.9 and 54.9 years old for PPP in subgroups A, B and C, respectively.

Domestic diagnosis codes

The distribution of domestic diagnosis codes divided into 8 diagnosis subgroups is shown in Table 2. In patients under the broad category of psoriasis, the proportion of males was lower than 50% for guttate psoriasis, pustular psoriasis, PPP and PAO but higher than 70% for erythrodermic psoriasis. Patients with guttate psoriasis were younger but patients with erythrodermic psoriasis were older than other types of psoriasis. In patients under the broad category of PPP, patients with PAO included more females and were younger than patients without PAO. When patients were subdivided into 3 department subgroups, more than half of patients were in the department subclass A (dermatology/rheumatology) for "pustular psoriasis" (2,953/4,636), "erythrodermic psoriasis" (1,045/1,610) and "psoriatic arthritis" (4,530/8,360) (online supplementary table S2).

Seasonal variation of the use of healthcare service

Figure 2 shows the seasonal variation of the use of the healthcare service in patients with psoriasis and PPP. On average, about 39% of patients with psoriasis and 36% of

patients with PPP used the healthcare service in each month. In patients with psoriasis, the proportion of patients who used the healthcare service in the hottest season (July or August of 2010) (52.6%) was similar to that in the coldest season (January or February of 2011) (53.0%) and the difference was -0.3% (95% CI -0.5 to -0.1%, P=0.0004). On the other hand, in patients with PPP, the proportion of patients who used the service in the hottest season (55.3%) was higher than that in the coldest season (45.3%) and the difference was 10.0% (9.8 to 10.3%, P<0.0001). As shown in online supplementary tables S3 and S4, the predominance of the use of the healthcare service in the hottest season in patients with PPP but not in patients with psoriasis was also observed in all of the 3 department subgroups.

Treatments for psoriasis and PPP

In table 3, treatments for psoriasis and PPP are summarized. Systemic therapies were used mainly for patients with psoriasis but a few patients with PPP also used etretinate and other systemic therapies. In patients treated by biologics, patients were relatively young and the proportion of patients with arthropathy was high. Of 3,291 patients with psoriasis on a biologic treatment, 2,674 (81.1%) were in the department subgroup A (dermatology/rheumatology) (online supplementary table S5). Phototherapy was more frequently used for patients with PPP than patients with psoriasis while topical vitamin D was selected more frequently for patients with psoriasis than patients with PPP. About 80% of patients with both psoriasis and PPP used topical corticosteroid. No treatment for psoriasis or PPP was given to about 9% of patients with psoriasis and about 16% of patients with PPP. Both for psoriasis and PPP, patients with no treatment included more patients with arthropathy when

compared with those with topical therapy particularly in the department subgroup B (other specialty) (online supplementary table S5).

Comorbidities of psoriasis and PPP

Table 4 shows the number of patients and standardized prevalence of concurrent diabetes mellitus, hyperlipidemia and hypertension in the severity classes I to III in patients with psoriasis and PPP. For patients with psoriasis, the standardized prevalence was higher in Class I (systemic therapy) than in Class III (topical therapy only) in the entire population as well as in 3 department subgroups (online supplementary table S6). The prevalence was similar between Class II (phototherapy) and Class III except for the department subgroup A (dermatology/rheumatology) where the prevalence was higher in Class II than in Class III. The prevalence of the comorbidities was lower in Class IV (no treatment) than Class III in the department subgroup A (dermatology/rheumatology) but higher in Class IV than in Class III in other department subgroups (online supplementary table S6). For patients with PPP, no remarkable difference was observed between Classes I, II and III.

DISCUSSION

We identified about 0.34% of patients with a diagnosis code of psoriasis and 0.12 % with a code of PPP in the JNDB during the 12-month period between April 2010 and March 2011. About 60% of patients with psoriasis were males while about two thirds of patients with PPP were females. The use of the healthcare service was roughly constant during the 12-month observation period in patients with psoriasis while the use of the service prevailed in summer in patients with PPP. The prevalence of the concurrent diabetes mellitus, hyperlipidemia and hypertension in patients with psoriasis receiving a systemic therapy was higher than that in those receiving a topical therapy only.

The prevalence of psoriasis in our study, 0.34%, was lower than 2 to 4 % in the Western countries and the male predominance in our study was different from the almost equal distribution of males and females in the Western countries ,[1-3]. The low prevalence and male predominance of patients with psoriasis were also found in other Asian countries: e.g., the prevalence of males and females was 0.23% and 0.16 % in Taiwan ,[4] and 0.54% and 0.44% in China ,[5], respectively. On the other hand, the prevalence of PPP in our study, 0.12% was higher than 0.01 to 0.05% in the Western countries though the female predominance in the current study was also observed in the Western countries ,[7,11,12]. Around 20% of patients with PPP were reported to have psoriasis ,[7,13] and in our study, 8.5% of patients with diagnosis code of PPP or PAO had psoriasis. We observed that the male to female ratio was different between psoriasis and PPP and that psoriasis was more prevalent in the older age group than PPP. The seasonal variation of the use of the healthcare service in patients with PPP, as a proxy of the disease activity, was not observed in patients with psoriasis.

According to the proposal in the International Psoriasis Council in 2007, PPP should be considered a separate condition from psoriasis ,[12,14]. The findings in the current descriptive epidemiological study indicated some relationship between psoriasis and PPP (e.g., the proportion of patients with psoriasis in those with PPP was 8.5% and higher than 0.34%, the prevalence of psoriasis in the whole population) but the difference for several aspects between psoriasis and PPP as well in accordance with the above-mentioned proposal.

About 9% of patients with psoriasis and 16% of patients with PPP had no therapy for psoriasis and PPP in our study. In the previous study in the UK, one third of patients with psoriasis were not using any therapy at the time of evaluation ,[1]. According to a survey conducted in the US between 2003 and 2011, 49, 24 and 9% of patients with mild, moderate and severe psoriasis were untreated and about half of patients were dissatisfied with their treatment ,[15]. Likewise, about 9% of patients with psoriasis and about 16% of patients with PPP receiving no therapy for psoriasis and PPP in our study may include those who are dissatisfied with the treatment. However, some of them might receive no therapy for psoriasis and PPP simply because they had very mild disease. Interestingly, as shown in online supplementary table S5, patients with no treatment for psoriasis and PPP included more patients with arthropathy than those with topical therapy particularly in the department subgroup B (other specialty). Thus, the severity class IV (no treatment) in the department subgroup B might represent more severe psoriasis or PPP than the severity class III (topical therapy only) while in other department subgroups, the severity class IV might represent not so severe psoriasis or PPP when compared to the severity class III.

Many studies conducted in the Western and Asian countries reported that the

prevalence and incidence of the risk factors for myocardial infarction and stroke such as diabetes mellitus, hyperlipidemia and hypertension were high in patients with psoriasis, particularly in those with severe psoriasis ,[16-19]. The reasons why the ~~increased~~ risk of those conditions is increased in psoriasis have not been fully determined but the increased risk may be due to the high prevalence of obesity and other known predisposing factors ,[20]. It is also possible that some of the comorbidities are adverse reactions to ciclosporin and other systematic therapies for psoriasis ,[21]. In our study, the increase of the comorbidity was observed in patients with severe psoriasis but not in patients with severe PPP when compared with patients with topical therapy only. One possible interpretation for this observation is that ciclosporin is the major contributor to the high prevalence of the comorbidity because ciclosporin was used by more than half of patients with psoriasis receiving a systemic therapy while ciclosporin was used only by 10% of those with PPP receiving a systematic therapy.

The main limitation of the current study is that the diagnosis codes of psoriasis and PPP are not validated. Therefore, the true national prevalence may be higher or lower than that reported in the current study. One concern is misclassification of diseases particularly when the diagnosis is made by a non-specialist. However, demographic characteristics and other major findings were common to the whole population and department subgroup A (dermatology/rheumatology). This finding would suggest that the whole patients identified by diagnosis codes of the claims in the current study roughly represented patients with psoriasis and PPP who used healthcare service during the observation period in the nation. Nevertheless, we could not exclude some types of misclassification. For instance, the proportion of guttate psoriasis in patients with psoriasis was around 4% in a previous study in Japan ,[22] and higher than 0.6%

in the current study (table 2), which could be due to misclassification. The strength of the study is the use of the claims database covering most (more than 90%) patients in the nation.

In conclusion, the study using the JNDB collected from the whole nation revealed that the prevalence of psoriasis was lower and the prevalence of PPP was higher than that in the Western countries. As in the previous studies, the severe psoriasis was associated with the high prevalence of the concurrent diabetes mellitus, hyperlipidemia and hypertension. The national prevalence and other characteristics of psoriasis and PPP estimated in the current descriptive study may provide the basic information for the future studies.

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Contributors KK conceived and designed the study, analyzed and interpreted the data and drafted the manuscript. YK analyzed and interpreted the data. TS, NO and DK contributed to procedures to acquire the data and interpreted the data. HI and HN contributed to conception and design of the study. In addition, all authors carefully reviewed the draft and revised it critically. All authors gave the final approval of the manuscript.

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Table 1

Age-sex distribution of patients with psoriasis and PPP in Japanese National Database

	Psoriasis*			PPP		
	N			N		
Age	Male	Female	Total	Male	Female	Total
0-9	3,376	3,177	6,553	396	382	778
10-19	4,430	5,046	9,476	689	923	1,612
20-29	9,800	9,904	19,704	1,821	3,673	5,494
30-39	27,915	22,251	50,166	5,049	9,388	14,437
40-49	34,637	21,588	56,225	7,256	13,237	20,493
50-59	44,963	28,146	73,109	10,318	23,157	33,475
60-69	59,510	33,907	93,417	12,384	23,021	35,405
70-79	48,072	30,930	79,002	7,070	11,559	18,629
80-	21,070	20,957	42,027	2,265	3,636	5,901
Total	253,773	175,906	429,679	47,248	88,976	136,224

* Patients with both of diagnosis codes of psoriasis and PPP are classified as those with psoriasis

PPP, palmoplantar pustulosis.

Table 2

Diagnoses given in claims for patients with psoriasis and PPP in Japanese National Database

Diagnoses	N *	(%)	Male	(%)	Age	(SD)
Psoriasis						
Plaque psoriasis	418,705	(97.4)	248,770	(59.4)	56.7	(18.7)
Scalp psoriasis	2,832	(0.7)	1,682	(59.4)	57.2	(18.1)
Guttate psoriasis	2,572	(0.6)	1,136	(44.2)	42.4	(20.6)
Psoriatic arthritis	8,360	(1.9)	4,431	(53.0)	55.5	(15.1)
Pustular psoriasis	4,636	(1.1)	2,250	(48.5)	55.9	(19.3)
Erythrodermic psoriasis	1,610	(0.4)	1,176	(73.0)	60.4	(17.2)]
PPP †	12,625	(2.9)	4,675	(37.0)	58.3	(13.7)
PAO †	401	(0.1)	85	(21.2)	53.1	(12.1)
Total	429,679	(100)	253,773	(59.1)	56.7	(18.7)
PPP						
PPP	135,647	(99.6)	47,063	(34.7)	55.5	(15.5)
PAO	5,734	(4.2)	1,307	(22.8)	52.1	(12.6)
Total	136,224	(100)	47,248	(34.7)	55.5	(15.5)

* One patient is counted once for each diagnosis and sum of patients with 8 diagnoses for psoriasis and that of 2 diagnoses for PPP exceed a total.

† Patients with diagnosis codes of psoriasis and PPP or PAO.

PPP, palmoplantar pustulosis; PAO, pustulotic arthro-osteitis.

Table 3

Treatments for psoriasis and PPP in Japanese National Database

PAO	Psoriasis N=429,679				PPP N=136,224			
		Male		Psoriatic arthritis		Male		
	N* (%)	N (%)	Age (SD)	N (%)	N* (%)	N (%)	Age (SD)	N (%)
Systemic therapy								
Adalimumab	1,322 (0.3)	892 (67.5)	50.0 (14.0)	453 (34.3)	64 (0.05)	12 (18.8)	59.1 (12.1)	7 (10.9)
Infliximab	2,141 (0.5)	1,344 (62.8)	48.1 (13.9)	741 (34.6)	197 (0.1)	55 (27.9)	51.5 (13.5)	13 (6.6)
Ustekinumab	--†				--†			
Methotrexate	1,680 (0.4)	1,072 (63.8)	52.0 (15.5)	480 (28.6)	174 (0.1)	53 (30.5)	54.6 (13.4)	19 (10.9)
Ciclosporin	21,997 (5.1)	13,813 (62.8)	53.2 (16.2)	1,604 (7.3)	251 (0.2)	98 (39.0)	52.9 (13.8)	20 (8.0)
Etretinate	15,481 (3.6)	11,025 (71.2)	60.1 (13.6)	609 (3.9)	1,950 (1.4)	725 (37.2)	57.5 (11.7)	35 (1.8)
Phototherapy	21,005 (4.9)	12,370 (58.9)	54.6 (18.1)	309 (1.5)	10,408 (7.6)	3,657 (35.1)	53.3 (15.0)	156 (1.5)
Topical therapy								
Topical vitamin D (59.6)	256,122	156,050 (60.9)	53.4 (18.5)	3,698 (1.4)	42,903 (31.5)	14,276 (33.3)	53.0 (14.9)	612 (1.4)
Topical corticosteroid	349,568 (81.4)	211,744 (60.6)	54.9 (18.1)	5,323 (1.5)	109,692 (80.5)	37,881 (34.5)	53.4 (15.3)	3,576 (3.3)
No treatment	38,224 (8.9)	19,398 (50.7)	58.6 (19.5)	1,851 (4.8)	21,209 (15.6)	7,527 (35.5)	54.6 (16.2)	2,083 (9.8)

Table 3 --- continued

* One patient is counted once for each treatment.

† Less than 10 patients had ustekinumab which was approved in the last month of the observation period.

PPP, palmoplantar pustulosis; PAO, pustulotic arthro-osteitis.

Table 4

Prevalence of diabetes mellitus, hyperlipidemia and hypertension in 3 severity classes of patients with psoriasis and PPP in Japanese National Database

	Psoriasis			PPP		
	Class I Systemic therapy *	Class II Photo-therapy †	Class III Topical therapy ‡	Class I Systemic therapy *	Class II Photo-therapy †	Class III Topical therapy ‡
	N= 39,796	N= 18,833	N= 332,826	N= 2,588	N= 10,153	N= 102,274
Diabetes mellitus						
N §	5,271	1,747	32,378	260	686	7,585
Prevalence ¶ (%)	12.7	9.0	9.6	9.3	7.7	8.5
Difference ** (%)	3.1	-0.6	ref	0.8	-0.8	ref
(95%CI)	(2.7,3.4)	(-1.0,-0.2)		(-0.5,2.1)	(-1.4,-0.2)	
Hyperlipidemia						
N §	8,208	3,125	56,561	557	1,731	17,783
Prevalence ¶ (%)	20.7	16.7	17.5	18.3	17.4	17.3
Difference ** (%)	3.2	-0.8	ref	1.0	0.1	ref
(95%CI)	(2.8,3.6)	(-1.3,-0.3)		(-0.6,2.6)	(-0.7,1.0)	
Hypertension						
N §	11,795	4,369	78,996	576	1,885	19,332
Prevalence ¶ (%)	28.5	22.8	23.4	22.4	21.8	21.7
Difference ** (%)	5.1	-0.6	ref	0.6	0.04	ref
(95%CI)	(4.7,5.6)	(-1.2,-0.1)		(-1.0,2.3)	(-0.9,0.9)	

* Patients who had one or more of systemic therapies given in Table 3.

† Patients with phototherapy but no systemic therapy.

‡ Patients with topical vitamin D or topical corticosteroid only.

§ Number of patients with a diagnosis code of the concurrent disease (diabetes mellitus, hyperlipidemia or hypertension) at least in one claim as well as drugs to treat the concurrent disease in the claims issued in 2 or more different months.

¶ Prevalence standardized to the distribution of age and sex in the entire study population of 565,903 subjects.

** Difference in prevalence compared with Class III.

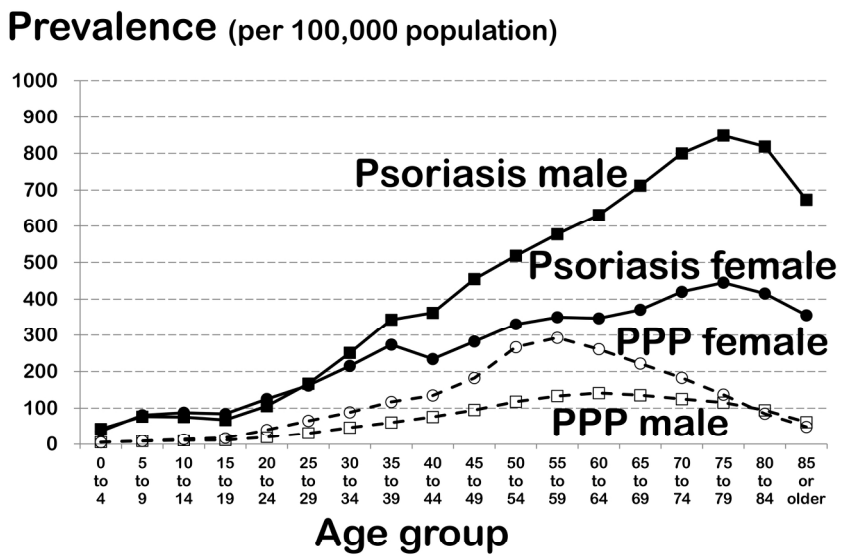
Table 4 --- continued

PPP, palmoplantar pustulosis; CI, confidence interval.

Legends of figures

Figure 1. The national prevalence of psoriasis and palmoplantar pustulosis (PPP) in Japanese population. The prevalence was estimated as the counts of patients with psoriasis or PPP in the Japanese national claims database between April 2010 and March 2011 divided by the population size in the census data as of October 2010.

Figure 2. The use of the healthcare service in patients with psoriasis and palmoplantar pustulosis (PPP). The proportion was estimated as the number of patients for whom a claim with a diagnosis code of psoriasis or PPP was issued in each of 12 months between April 2010 and March 2011 divided by the number of the whole patients with psoriasis and PPP, respectively.



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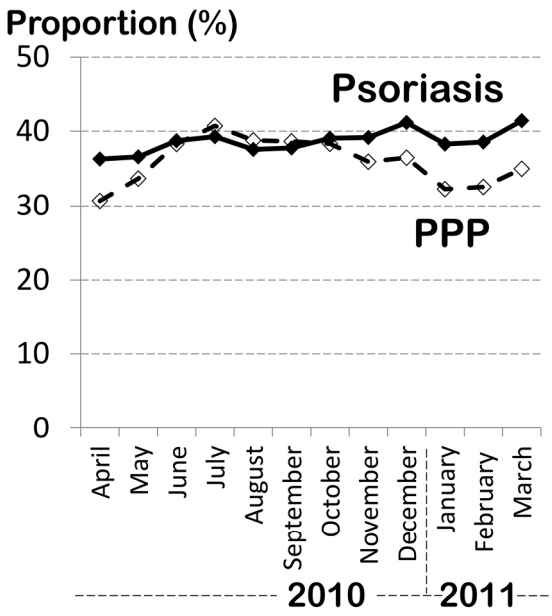

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Supplementary Tables

Supplementary Table S1

Age-sex distribution of patients with psoriasis and PPP subdivided by the department specified in a claim with a diagnosis code of psoriasis and PPP in Japanese National Database

	Psoriasis[a]		PPP	
Age (years old)	Male N (%)	Female N (%)	Male N (%)	Female N (%)
All patients				
0-9	3,376 (1.3)	3,177 (1.8)	396 (0.8)	382 (0.4)
10-19	4,430 (1.7)	5,046 (2.9)	689 (1.5)	923 (1.0)
20-29	9,800 (3.9)	9,904 (5.6)	1,821 (3.9)	3,673 (4.1)
30-39	27,915 (11.0)	22,251 (12.6)	5,049 (10.7)	9,388 (10.6)
40-49	34,637 (13.6)	21,588 (12.3)	7,256 (15.4)	13,237 (14.9)
50-59	44,963 (17.7)	28,146 (16.0)	10,318 (21.8)	23,157 (26.0)
60-69	59,510 (23.5)	33,907 (19.3)	12,384 (26.2)	23,021 (25.9)
70-79	48,072 (18.9)	30,930 (17.6)	7,070 (15.0)	11,559 (13.0)
80-	21,070 (8.3)	20,957 (11.9)	2,265 (4.8)	3,636 (4.1)
Total	253,773 (100)	175,906 (100)	47,248 (100)	88,976 (100)
Mean (SD)	57.1 (17.8)	56.1 (19.9)	55.7 (16.1)	55.5 (15.2)
Patients of dermatology or rheumatology (subgroup A) [b]				
0-9	810 (1.0)	814 (1.6)	36 (0.4)	88 (0.3)
10-19	1,137 (1.4)	1,278 (2.5)	70 (0.8)	110 (0.6)
20-29	2,659 (3.3)	2,561 (5.0)	247 (2.7)	578 (3.2)
30-39	7,677 (9.5)	5,582 (10.9)	828 (8.9)	1,567 (8.8)
40-49	9,831 (12.1)	5,978 (11.7)	1,247 (13.4)	2,464 (13.8)
50-59	13,674 (16.9)	8,607 (16.8)	1,946 (20.9)	4,777 (26.7)
60-69	20,802 (25.7)	11,290 (22.0)	2,851 (30.6)	5,226 (29.2)
70-79	17,355 (21.4)	9,840 (19.2)	1,638 (17.6)	2,493 (13.9)
80-	6,975 (8.6)	5,319 (10.4)	442 (4.8)	623 (3.5)
Total	80,920 (100)	51,269 (100)	9,305 (100)	17,890 (100)
Mean (SD)	58.8 (17.1)	57.1 (19.0)	58.1 (14.8)	56.8 (14.1)

Supplementary Table S1 -- continued

	Psoriasis[a]		PPP	
Age (years old)	Male N (%)	Female N (%)	Male N (%)	Female N (%)
Patients of department other than dermatology or rheumatology (subgroup B) [c]				
0-9	288 (1.5)	232 (1.6)	53 (1.3)	30 (0.4)
10-19	210 (1.1)	225 (1.6)	56 (1.3)	61 (0.7)
20-29	418 (2.2)	476 (3.3)	110 (2.6)	265 (3.2)
30-39	1,304 (6.8)	1,098 (7.6)	384 (9.2)	818 (9.9)
40-49	1,889 (9.8)	1,380 (9.5)	600 (14.4)	1,091 (13.2)
50-59	3,058 (15.9)	2,091 (14.4)	891 (21.4)	2,137 (25.9)
60-69	4,797 (24.9)	3,091 (21.3)	1,165 (28.0)	2,238 (27.1)
70-79	4,825 (25.1)	3,283 (22.6)	669 (16.1)	1,169 (14.2)
80-	2,460 (12.8)	2,638 (18.2)	226 (5.4)	448 (5.4)
Total	19,249 (100)	14,514 (100)	4,154 (100)	8,257 (100)
Mean (SD)	61.7 (17.2)	61.9 (18.9)	56.8 (16.1)	56.9 (15.0)
Patients of department not specified (subgroup C) [d]				
0-9	2,278 (1.5)	2,131 (1.9)	307 (0.9)	300 (0.5)
10-19	3,083 (2.0)	3,543 (3.2)	563 (1.7)	752 (1.2)
20-29	6,723 (4.4)	6,867 (6.2)	1,464 (4.3)	2,830 (4.5)
30-39	18,934 (12.3)	15,571 (14.1)	3,837 (11.4)	7,003 (11.1)
40-49	22,917 (14.9)	14,230 (12.9)	5,409 (16.0)	9,682 (15.4)
50-59	28,231 (18.4)	17,448 (15.8)	7,481 (22.1)	16,243 (25.9)
60-69	33,911 (22.1)	19,526 (17.7)	8,368 (24.8)	15,557 (24.8)
70-79	25,892 (16.9)	17,807 (16.2)	4,763 (14.1)	7,897 (12.6)
80-	11,635 (7.6)	13,000 (11.8)	1,597 (4.7)	2,565 (4.1)
Total	153,604 (100)	110,123 (100)	33,789 (100)	62,829 (100)
Mean (SD)	55.6 (18.0)	54.9 (20.3)	54.9 (16.4)	54.9 (15.4)

Supplementary Table S1 -- continued

a Patients with both of diagnosis codes of psoriasis and PPP are classified as those with psoriasis.

b Patients with at least one claim with diagnosis code of psoriasis or PPP where the department was specified as dermatology or rheumatology during the 12-month observation period.

c Patients with a diagnosis code of psoriasis or PPP where the department was specified as that other specialty but not as dermatology or rheumatology.

d Patients with a diagnosis code of psoriasis or PPP where the department was not specified.

PPP, palmoplantar pustulosis.

Supplementary Table S2

Diagnosis codes of psoriasis and PPP classified by the department specified in a claim in Japanese National Database

	Department Specified				Not specified [e]	All patients
	Derma [a]	Rheuma [b]	Derma/ rheuma [c]	Other specialty [d]		
	N [f] (%)	N [f] (%)	N [f] (%)	N [f] (%)	N [f] (%)	N [f] (%)
Psoriasis	130,953 (100)	2,301 (100)	132,189 (100)	33,763 (100)	263,727 (100)	429,679 (100)
Plaque psoriasis	127,170 (97.1)	1,602 (69.6)	127,822 (96.7)	30,808 (96.5)	260,075 (98.6)	418,705 (97.4)
Psoriasis vulgaris	103,573 (79.1)	1,161 (50.5)	104,002 (78.7)	20,202 (59.8)	214,621 (81.4)	338,825 (78.9)
Psoriasis	20,972 (16.0)	528 (22.9)	21,231 (16.1)	11,159 (33.1)	44,821 (17.0)	77,302 (18.0)
Psoriasis vulgaris of entire body	7,262 (5.5)	66 (2.9)	7,267 (5.5)	579 (1.7)	2,030 (0.8)	9,876 (2.3)
Psoriasis of extremities	387 (0.3)	---[g]	390 (0.3)	99 (0.3)	411 (0.2)	900 (0.2)
Psoriasis vulgaris of extremities	3,210 (2.5)	24 (1.0)	3,214 (2.4)	371 (1.1)	2,417 (0.9)	6,002 (1.4)
Psoriasis vulgaris of lower back	144 (0.1)	---[g]	144 (0.1)	38 (0.1)	74 (0.03)	256 (0.1)
Plaque psoriasis	70 (0.1)	---[g]	70 (0.1)	11 (0.03)	33 (0.01)	114 (0.03)

Supplementary Table S2 ---continued

	Department					All patients
	Specified				Not specified [e]	
	Derma [a]	Rheuma [b]	Derma/ rheuma [c]	Other specialty [d]		
	N [f] (%)	N [f] (%)	N [f] (%)	N [f] (%)	N [f] (%)	N [f] (%)
Scalp psoriasis	1,177 (0.9)	--- [g]	1,180 (0.9)	257 (0.8)	1,395 (0.5)	2,832 (0.7)
Seborrheic psoriasis [h]	123 (0.1)	--- [g]	123 (0.1)	118 (0.3)	350 (0.1)	591 (0.1)
Psoriasis vulgaris of scalp	1,055 (0.8)	--- [g]	1,058 (0.8)	140 (0.4)	1,046 (0.4)	2,244 (0.5)
Guttate psoriasis	1,241 (0.9)	--- [g]	1,242 (0.9)	137 (0.4)	1,193 (0.5)	2,572 (0.6)
Psoriatic arthritis	3,774 (2.9)	1,210 (52.6)	4,530 (3.4)	2,128 (6.3)	1,702 (0.6)	8,360 (1.9)
Psoriatic arthritis	3,686 (2.8)	960 (41.7)	4,206 (3.2)	1,529 (4.5)	1,410 (0.5)	7,145 (1.7)
Psoriatic arthritis mutilans [i]	63 (0.05)	244 (10.6)	292 (0.2)	575 (1.7)	272 (0.1)	1,139 (0.3)
Psoriatic spondylitis	82 (0.1)	24 (1.0)	93 (0.1)	45 (0.1)	25 (0.01)	163 (0.04)
Pustular psoriasis	2,941 (2.2)	67 (2.9)	2,953 (2.2)	409 (1.2)	1,274 (0.5)	4,636 (1.1)
Pustular psoriasis	2,595 (2.0)	62 (2.7)	2,606 (2.0)	238 (0.7)	822 (0.3)	3,666 (0.9)
Impetigo herpetiformis [j]	128 (0.1)	--- [g]	128 (0.1)	160 (0.5)	255 (0.1)	543 (0.1)

Supplementary Table S2 ---continued

	Department					All patients
	Specified				Not specified [e]	
	Derma [a]	Rheuma [b]	Derma/ rheuma [c]	Other specialty [d]		
	N [f] (%)	N [f] (%)	N [f] (%)	N [f] (%)	N [f] (%)	N [f] (%)
Acrodermatitis continua	242 (0.2)	--- [g]	243 (0.2)	12 (0.04)	199 (0.1)	454 (0.1)
Generalized pustular psoriasis	28 (0.02)	--- [g]	28 (0.02)	--- [g]	--- [g]	32 (0.01)
Acute generalized pustular Psoriasis	--- [g]	--- [g]	--- [g]	--- [g]	--- [g]	--- [g]
Erythrodermic psoriasis	1,045 (0.8)	35 (1.5)	1,057 (0.8)	223 (0.7)	330 (0.1)	1610 (0.4)
PPP	6,170 (4.7)	82 (3.6)	6,194 (4.7)	811 (2.4)	5,620 (2.1)	12,625 (2.9)
PAO [k]	173 (0.1)	21 (0.9)	180 (0.1)	73 (0.2)	146 (0.1)	401 (0.1)
PPP	26,928 (100)	435 (100)	27,195 (100)	12,411 (100)	96,618 (100)	136,224 (100)
PPP	26.880 (99.8)	394 (90.6)	27,109 (99.7)	11,979 (96.5)	96,559 (99.9)	135,647 (99.6)
PAO [l]	689 (2.6)	112 (25.7)	762 (2.8)	3,268 (26.3)	1,704 (1.8)	5,734 (4.2)

Supplementary Table S2 -- continued

a Patients with at least one claim with a diagnosis code of psoriasis or PPP where the department was specified as dermatology during the 12-month observation period.
b Patients with at least one claim where the department was specified as rheumatology.
c Patients with at least one claim where the department was specified as dermatology or rheumatology (department subgroup A).
d Patients with any claim where the department was specified as other specialty but not dermatology or rheumatology (department subgroup B).
e Patients with claims where the department was not specified (department subgroup C).
f One patient is counted once for each code and for subclass of diagnosis and therefore sum of lower categories may exceed a total of upper category.
g Less than 10 patients were found.
h "Internal medicine" was specified for 68 (58%) of 118 patients with "Seborrheic psoriasis" in the department of other specialty.
i "Orthopedics" was specified for 470 (82%) of 575 patients with "Psoriatic arthritis mutilans" in the department of other specialty.
j "Internal medicine" was specified for 61 (38%) of 160 patients with "Impetigo herpetiformis" in the department of other specialty.
k "Internal medicine" was specified for 54 (74%) of 73 patients with "PAO" in the department of other specialty under the broad disease category of psoriasis.
l "Internal medicine" was specified for 2978 (91%) of 3268 patients with "PAO" in the department of other specialty under the broad disease category of PPP.
PPP, palmoplantar pustulosis; PAO, pustulotic arthro-osteitis.

Supplementary Table S3

Use of healthcare service in each of 12 months during the study period in patients with psoriasis and PPP subdivided by the department in a claim with diagnosis code of psoriasis and PPP in Japanese National Database

	All		Dermatology or rheumatology (subgroup A)		Other specialty (subgroup B)		Department not specified (subgroup C)	
Year and Month	N [b]	%	N [b]	%	N [b]	%	N [b]	%
Patients with Psoriasis								
2010 April	155,927	36.3	57,385	43.4	15,271	45.2	83,271	31.6
2010 May	157,238	36.6	57,029	43.1	14,884	44.1	85,325	32.4
2010 June	166,483	38.7	59,989	45.4	15,409	45.6	91,085	34.5
2010 July	168,831	39.3	60,186	45.5	15,495	45.9	93,150	35.3
2010 August	161,494	37.6	59,172	44.8	14,974	44.4	87,348	33.1
2010 September	162,322	37.8	59,257	44.8	15,182	45.0	87,883	33.3
2010 October	167,886	39.1	59,960	45.4	15,148	44.9	92,778	35.2
2010 November	168,288	39.2	60,074	45.4	15,295	45.3	92,919	35.2
2010 December	176,910	41.2	62,093	47.0	15,562	46.1	99,255	37.6
2011 January	164,580	38.3	59,920	45.3	15,067	44.6	89,593	34.0
2011 February	165,743	38.6	58,425	44.2	14,937	44.2	92,381	35.0
2011 March	177,900	41.4	62,591	47.3	15,968	47.3	99,341	37.7
Total	429,679	100.0	132,189	100.0	33,763	100.0	263,727	100.0

Supplementary Table S3 -- continued

Year and Month	All N [b]	All %	Dermatology or rheumatology (subgroup A) N [b]	Dermatology or rheumatology (subgroup A) %	Other specialty (subgroup B) N [b]	Other specialty (subgroup B) %	Department not specified (subgroup C) N [b]	Department not specified (subgroup C) %
Patients with PPP								
2010 April	41,825	30.7	9,388	34.5	4,747	38.2	27,690	28.7
2010 May	45,888	33.7	9,912	36.4	4,523	36.4	31,453	32.6
2010 June	52,193	38.3	11,172	41.1	5,045	40.6	35,976	37.2
2010 July	55,463	40.7	11,508	42.3	5,126	41.3	38,829	10.2
2010 August	52,850	38.8	11,329	41.7	4,903	39.5	36,618	37.9
2010 September	52,649	38.6	11,375	41.8	5,065	40.8	36,209	37.5
2010 October	52,229	38.3	11,193	41.2	4,988	40.2	36,048	37.3
2010 November	48,962	35.9	10,464	38.5	4,753	38.3	33,745	34.9
2010 December	49,679	36.5	10,606	39.0	4,757	38.3	34,316	35.5
2011 January	43,971	32.3	9,801	36.0	4,432	35.7	29,738	30.8
2011 February	44,373	32.6	9,603	35.3	4,461	35.9	30,309	31.4
2011 March	47,678	35.0	10,289	37.8	4,716	38.0	32,673	33.8
Total	136,224	100.0	27,195	100.0	12,411	100.0	96,618	100.0

a Patients with at least one claim with diagnosis code of psoriasis or PPP where the department was specified as either dermatology or rheumatology ("Dermatology or rheumatology") or other specialty but not dermatology or rheumatology ("Other specialty") during the 12-month observation period.

b Number of patients with a claim with a diagnosis code of psoriasis or PPP.

PPP, palmoplantar pustulosis.

Supplementary Table S4

Seasonal variation of use of healthcare service in patients with a diagnosis code of psoriasis and PPP in Japanese National Database

Use of health-care service					
2010 July or August	2011 January or February	Psoriasis N [a]	%	PPP N [a]	%
All patients					
Yes	Yes	147,254	34.3	41,153	30.2
Yes	No	78,956	18.4	34,229	25.1
No	Yes	80,384	18.7	20,548	15.1
No	No	123,085	28.6	40,294	29.6
Total		429,679	100.0	136,224	100.0
Difference (95% CI) [b]		-0.33% (-0.51 to -0.15%)		10.0% (9.8 to 10.3%)	
P value [c]		0.0004		<0.0001	
Patients of dermatology or rheumatology (subgroup A) [d]					
Yes	Yes	58,962	44.6	9,905	36.4
Yes	No	22,384	16.9	6,267	23.0
No	Yes	22,328	16.9	4,164	15.3
No	No	28,515	21.6	6,859	25.2
Total		132,189	100.0	27,195	100.0
Difference (95% CI) [b]		0.04% (-0.27 to 0.36%)		7.7% (7.1 to 8.4%)	
P value [c]		0.79		<0.0001	
Patients of department of other specialty (subgroup B) [e]					
Yes	Yes	14,223	42.1	4,596	37.0
Yes	No	5,714	16.9	2,615	21.1
No	Yes	5,497	16.3	1,790	14.4
No	No	8,329	24.7	3,410	27.5
Total		33,763	100.0	12,411	100.0
Difference (95% CI) [b]		0.64% (0.03 to 1.25%)		6.6% (5.7 to 7.6%)	
P value [c]		0.04		<0.0001	

Supplementary Table S4 --- continued

Use of health-care service					
2010 July or August	2011 January or February	Psoriasis N [a]	%	PPP N [a]	%
Patients of department not specified (subgroup C) [f]					
Yes	Yes	74,069	32.7	26,652	27.6
Yes	No	50,858	19.9	25,347	26.2
No	Yes	52,559	19.3	14,594	15.1
No	No	86,241	28.0	30,025	31.1
Total		263,727	100.0	96,618	100.0
Difference (95% CI) [b]		-0.64% (-0.88 to -0.40%)		11.1% (10.8 to 11.5%)	
P value [b]		<0.0001		<0.0001	

a Number of patients with a claim with a diagnosis code of psoriasis or PPP.

b Difference between the proportion of patients who used the healthcare service in the hottest season (July or August 2010) and the proportion of patients who used the service in the coldest season (January or February of 2011).

c The result of paired t-test is shown.

d Patients with at least one claim with diagnosis code of psoriasis or PPP where the department was specified as dermatology or rheumatology during the 12-month observation period.

e Patients with a diagnosis code of psoriasis or PPP where the department was specified as other specialty but not as dermatology or rheumatology.

f Patients with a diagnosis code of psoriasis or PPP where the department was not specified.

PPP, palmoplantar pustulosis.

Supplementary Table S5

Treatments for psoriasis and PPP subdivided by the department specified in a claim with a diagnosis code of psoriasis and PPP in Japanese National Database

	Psoriasis				PPP			
		Male		Psoriatic arthritis		Male		PAO
	N [a] (%)	N (%)	Age (SD)	N (%)	N [a] (%)	N (%)	Age (SD)	N (%)
All patients								
	N=429,679				N=136,224			
Systemic therapy								
Biologics	3,291 (0.8)	2,132 (64.8)	48.9 (14.1)	1,111 (33.8)	253 (0.2)	65 (25.7)	53.2 (13.6)	20 (7.9)
Methotrexate	1,680 (0.4)	1,072 (63.8)	52.0 (15.5)	480 (28.6)	174 (0.1)	53 (30.5)	54.6 (13.4)	19 (10.9)
Ciclosporin	21,997 (5.1)	13,813 (62.8)	53.2 (16.2)	1,604 (7.3)	251 (0.2)	98 (39.0)	52.9 (13.8)	20 (8.0)
Etretinate	15,481 (3.6)	11,025 (71.2)	60.1 (13.6)	609 (3.9)	1,950 (1.4)	725 (37.2)	57.5 (11.7)	35 (1.8)
Phototherapy	21,005 (4.9)	12,370 (58.9)	54.6 (18.1)	309 (1.5)	10,408 (7.6)	3,657 (35.1)	53.3 (15.0)	156 (1.5)
Topical therapy								
Topical vitamin D	256,122 (59.6)	156,050 (60.9)	53.4 (18.5)	3,698 (1.4)	42,903 (31.5)	14,276 (33.3)	53.0 (14.9)	612 (1.4)
Topical corticosteroid	349,568 (81.4)	211,744 (60.6)	54.9 (18.1)	5,323 (1.5)	109,692 (80.5)	37,881 (34.5)	53.4 (15.3)	3,576 (3.3)
No treatment	38,224 (8.9)	19,393 (50.7)	58.6 (19.5)	1,851 (4.8)	21,209 (15.6)	7,527 (35.5)	54.6 (16.2)	2,083 (9.8)

Supplementary Table S5 --- continued

	Psoriasis				PPP			
		Male		Psoriatic arthritis		Male		PAO
	N [a] (%)	N (%)	Age (SD)	N (%)	N [a] (%)	N (%)	Age (SD)	N (%)
Patients of dermatology or rheumatology (subgroup A) [b]								
	N=132,189				N=27,195			
Systemic therapy								
Biologics	2,674 (2.0)	1,827 (68.3)	48.4 (13.8)	895 (33.5)	112 (0.4)	28 (25.0)	54.5 (11.9)	--[c]
Methotrexate	681 (0.5)	436 (64.0)	51.1 (15.6)	280 (41.1)	67 (0.2)	14 (20.9)	51.8 (13.0)	13 (19.4)
Ciclosporin	12,330 (9.3)	7,917 (64.2)	52.8 (15.8)	1,023 (8.3)	109 (0.4)	37 (33.9)	54.4 (11.9)	--[c]
Etretinate	9,010 (6.8)	6,387 (70.9)	60.6 (13.5)	501 (5.6)	744 (2.7)	271 (36.4)	57.4 (10.7)	26 (3.5)
Phototherapy	5,465 (4.1)	3,352 (61.3)	56.4 (16.9)	181 (3.3)	1,529 (5.6)	498 (32.6)	53.9 (14.2)	43 (2.8)
Topical therapy								
Topical vitamin D	86,201 (65.2)	54,802 (63.6)	55.9 (17.7)	2,736 (3.2)	11,194 (41.2)	3,737 (33.4)	54.9 (14.0)	365 (3.3)
Topical corticosteroid	112,813 (85.3)	70,655 (62.6)	56.8 (17.3)	3,580 (3.2)	23,415 (86.1)	8,006 (34.2)	55.3 (14.3)	623 (2.7)
No treatment	7,621 (5.8)	3,809 (50.0)	54.8 (19.7)	448 (5.9)	2,732 (10.0)	941 (34.4)	55.3 (14.5)	114 (4.2)

Supplementary Table S5 --- continued

	Psoriasis				PPP			
		Male		Psoriatic arthritis		Male		PAO
	N [a] (%)	N (%)	Age (SD)	N (%)	N [a] (%)	N (%)	Age (SD)	N (%)
Patients of department other specialty (subgroup B) [d]								
	N=33,763				N=12,411			
Systemic therapy								
Biologics	294 (0.9)	163 (55.4)	49.5 (15.0)	155 (52.7)	51 (0.4)	12 (23.5)	51.9 (11.8)	11 (21.6)
Methotrexate	265 (0.8)	146 (55.1)	50.3 (16.3)	133 (50.2)	38 (0.3)	15 (39.5)	56.7 (11.9)	--[c]
Ciclosporin	2,474 (7.3)	1,247 (50.4)	57.5 (16.0)	350 (14.1)	38 (0.3)	13 (34.2)	54.1 (16.2)	10 (26.3)
Etretinate	650 (1.9)	462 (71.1)	63.3 (13.5)	27 (4.2)	72 (0.6)	21 (29.2)	57.1 (11.8)	--[c]
Phototherapy	689 (2.0)	415 (60.2)	61.0 (16.7)	36 (5.2)	386 (3.1)	135 (35.0)	54.1 (14.8)	74 (19.2)
Topical therapy								
Topical vitamin D	11,608 (34.4)	7,379 (63.6)	58.6 (17.3)	391 (3.4)	1,832 (14.8)	579 (31.6)	54.3 (14.7)	153 (8.4)
Topical corticosteroid	19,804 (58.7)	12,008 (60.6)	59.1 (18.4)	869 (4.4)	7,037 (56.7)	2,304 (32.7)	54.1 (15.7)	1,858 (26.4)
No treatment	9,906 (29.3)	5,121 (51.7)	62.1 (17.0)	921 (9.3)	5,005 (40.3)	1,735 (34.7)	55.9 (14.9)	1,391 (27.8)

Supplementary Table S5 --- continued

	Psoriasis				PPP			
		Male		Psoriatic arthritis		Male		PAO
	N [a] (%)	N (%)	Age (SD)	N (%)	N [a] (%)	N (%)	Age (SD)	N (%)
Patients of department not specified (subgroup C) [e]								
	N=263,727				N=96,618			
Systemic therapy								
Biologics	323 (0.1)	142 (44.0)	52.5 (15.0)	61 (18.9)	90 (0.1)	25 (27.8)	52.3 (16.3)	--[c]
Methotrexate	734 (0.3)	490 (66.8)	53.5 (15.0)	67 (9.1)	69 (0.1)	24 (34.8)	56.2 (14.3)	--[c]
Ciclosporin	7,193 (2.7)	4,649 (64.6)	52.4 (16.7)	231 (3.2)	104 (0.1)	48 (46.2)	50.8 (14.5)	--[c]
Etretinate	5,821 (2.2)	4,176 (71.7)	59.0 (13.6)	81 (1.4)	1,134 (1.2)	433 (38.2)	57.6 (12.4)	--[c]
Phototherapy	14,851 (5.6)	8,603 (57.9)	53.6 (18.5)	92 (0.6)	8,493 (8.8)	3,024 (35.6)	53.1 (15.1)	39 (0.5)
Topical therapy								
Topical vitamin D	158,313 (60.0)	93,869 (59.3)	51.6 (18.8)	571 (0.4)	29,877 (30.9)	9,960 (33.3)	52.2 (15.1)	94 (0.3)
Topical corticosteroid	216,951 (82.3)	129,081 (59.5)	53.5 (18.3)	874 (0.4)	79,240 (82.0)	27,571 (34.8)	52.8 (15.4)	1,095 (1.4)
No treatment	20,697 (7.8)	10,463 (50.6)	58.3 (20.3)	482 (2.3)	13,472 (13.9)	4,851 (36.0)	53.9 (16.9)	578 (4.3)

Supplementary Table S5 -- continued

a One patient is counted once for each treatment.

b Patients with at least one claim with a diagnosis code of psoriasis or PPP where the department was specified as dermatology or rheumatology during the 12-month observation period.

c Less than 10 patients had the treatment.

d Patients with a diagnosis code of psoriasis or PPP where the department was specified as other specialty but not as dermatology or rheumatology.

e Patients with a diagnosis code of psoriasis or PPP where the department was not specified.

PPP, palmoplantar pustulosis; PAO, pustulotic arthro-osteitis.

Supplementary Table S6

Prevalence of diabetes mellitus, hyperlipidemia and hypertension in severity classes I to IV of patients with psoriasis and PPP subdivided by the department specified in the claim in Japanese National Database

	All patients		Patients of dermatol or rheumatol [a] (subgroup A)		Patients of other department [b] (subgroup B)		Patients of department not specified [c] (subgroup C)	
	Psoriasis	PPP	Psoriasis	PPP	Psoriasis	PPP	Psoriasis	PPP
Severity Class I (systemic therapy)								
Total N	39,796	2,588	22,641	1,009	3,520	194	13,635	1,385
Diabetes mellitus								
N [d]	5,271	260	3,121	111	747	21	1,403	128
Prevalence [e] (%)	12.7	9.3	13.2	11.2	19.4	10.9	9.5	7.7
Difference [f] (%)	3.1	0.8	2.1	1.2	5.8	-0.6	1.4	0.3
(95%CI)	(2.7,3.4)	(-0.5,2.1)	(1.6,2.5)	(-1.4,3.9)	(4.5,7.1)	(-5.8,4.6)	(0.9,1.9)	(-1.1,1.8)
Hyperlipidemia								
N [d]	8,208	557	4,725	239	1,003	32	2,480	286
Prevalence [e] (%)	20.7	18.3	21.1	20.2	25.1	15.3	17.6	16.6
Difference [f] (%)	3.2	1.0	2.5	2.0	6.2	-2.7	1.5	0.4
(95%CI)	(2.8,3.6)	(-0.6,2.6)	(1.9,3.1)	(-0.9,5.0)	(4.8,7.7)	(-8.2,2.8)	(0.8,2.1)	(-1.5,2.4)
Hypertension								
N [d]	11,795	576	7,150	230	1,235	38	3,410	308
Prevalence [e] (%)	28.5	22.4	30.5	22.7	30.8	18.9	23.2	21.6
Difference [f] (%)	5.1	0.6	5.9	0.0	3.4	-5.7	1.5	1.1
(95%CI)	(4.7,5.6)	(-1.0,2.3)	(5.3,6.6)	(-3.0,3.0)	(1.9,4.9)	(-11.9,0.5)	(0.8,2.2)	(-1.0,3.2)

Supplementary Table S6 -- continued

	All patients		Patients of dermatol or rheumatol [a] (subgroup A)		Patients of other department [b] (subgroup B)		Patients of department not specified [c] (subgroup C)	
	Psoriasis	PPP	Psoriasis	PPP	Psoriasis	PPP	Psoriasis	PPP
Severity Class II (phototherapy without systemic therapy)								
Total N	18,833	10,153	4,332	1,452	614	379	13,887	8,322
Diabetes mellitus								
N [d]	1,747	686	496	98	89	29	1,162	559
Prevalence [e] (%)	9.0	7.7	13.2	11.2	12.0	9.6	8.0	7.2
Difference [f] (%)	-0.6	-0.8	2.1	1.2	-1.6	-1.8	-0.1	-0.2
(95%CI)	(-1.0,-0.2)	(-1.4,-0.2)	(1.6,2.5)	(-1.4,3.9)	(-4.1,0.8)	(-4.9,1.3)	(-0.6,0.3)	(-0.9,0.5)
Hyperlipidemia								
N [d]	3,125	1,731	811	268	131	71	2,183	1,392
Prevalence [e] (%)	16.7	17.4	21.1	20.2	17.8	16.9	15.5	16.5
Difference [f] (%)	-0.8	0.1	2.5	2.0	-1.0	-1.1	-0.6	0.3
(95%CI)	(-1.3,-0.3)	(-0.7,1.0)	(1.9,3.1)	(-0.9,5.0)	(-3.9,1.9)	(-5.0,2.8)	(-1.2,0.0)	(-0.6,1.2)
Hypertension								
N [d]	4,369	1,885	1,169	281	196	93	3,004	1,511
Prevalence [e] (%)	22.8	21.8	30.5	22.7	23.7	23.6	21.3	20.7
Difference [f] (%)	-0.6	0.0	5.9	0.0	-3.8	-1.0	-0.5	0.3
(95%CI)	(-1.2,-0.1)	(-0.9,0.9)	(5.3,6.6)	(-3.0,3.0)	(-6.6,-0.9)	(-5.2,3.2)	(-1.1,0.2)	(-0.7,1.2)

Supplementary Table 6 -- continued

	All patients		Patients of dermatol or rheumatol [a] (subgroup A)		Patients of other department [b] (subgroup B)		Patients of department not specified [c] (subgroup C)	
	Psoriasis	PPP	Psoriasis	PPP	Psoriasis	PPP	Psoriasis	PPP
Severity Class III (topical therapy only)								
Total N	332,826	102,274	97,595	22,002	19,723	6,833	215,508	73,439
Diabetes mellitus								
N [d]	32,378	7,583	11,886	2,141	2,985	725	17,507	4,717
Prevalence [e] (%)	9.6	8.5	11.1	10.0	13.6	11.5	8.2	7.4
Difference [f] (%)	ref	ref	ref	ref	ref	ref	ref	ref
Hyperlipidemia								
N [d]	56,561	17,783	19,006	4,434	4,206	1,315	33,289	12,034
Prevalence [e] (%)	17.5	17.3	18.6	18.2	18.9	18.0	16.1	16.2
Difference [f] (%)	ref	ref	ref	ref	ref	ref	ref	ref
Hypertension								
N [d]	78,996	19,322	26,307	4,781	6,484	1,548	46,205	12,993
Prevalence [e] (%)	23.4	21.7	24.5	22.7	27.4	24.6	21.7	20.4
Difference [f] (%)	ref	ref	ref	ref	ref	ref	ref	ref

Supplementary Table S6 -- continued

	All patients		Patients of dermatol or rheumatol [a] (subgroup A)		Patients of other department [b] (subgroup B)		Patients of department not specified [c] (subgroup C)	
	Psoriasis	PPP	Psoriasis	PPP	Psoriasis	PPP	Psoriasis	PPP
Severity Class IV (No treatment)								
Total N	38,224	21,209	7,621	2,732	9,906	5,005	20,697	13,472
Diabetes mellitus								
N [d]	4,669	2,061	808	261	1,676	622	2,185	1,178
Prevalence [e] (%)	11.5	10.4	10.6	10.1	15.1	13.0	9.6	9.1
Difference [f] (%)	1.9	2.0	-0.6	0.1	1.5	1.5	1.4	1.7
(95%CI)	(1.6,2.2)	(1.5,2.4)	(-1.3,0.1)	(-1.2,1.5)	(0.6,2.4)	(0.2,2.8)	(1.0,1.8)	(1.2,2.3)
Hyperlipidemia								
N [d]	7,771	4,283	1,318	536	2,340	1,087	4,113	2,660
Prevalence [e] (%)	18.9	18.6	16.7	17.7	19.8	18.6	18.0	17.7
Difference [f] (%)	1.4	1.4	-2.0	-0.4	1.0	0.6	1.9	1.5
(95%CI)	(1.0,1.8)	(0.8,2.0)	(-2.8,-1.1)	(-2.0,1.1)	(0.1,1.9)	(-0.9,2.1)	(1.4,2.4)	(0.8,2.2)
Hypertension								
N [d]	11,061	4,786	1,675	572	3,547	1,293	5,839	2,921
Prevalence [e] (%)	25.5	23.9	21.2	21.8	28.6	25.6	24.0	22.4
Difference [f] (%)	2.1	2.1	-3.4	-0.9	1.2	1.0	2.3	2.0
(95%CI)	(1.7,2.6)	(1.5,2.8)	(-4.3,-2.5)	(-2.6,0.9)	(0.2,2.2)	(-0.6,2.5)	(1.7,2.8)	(1.2,2.8)

Supplementary Table S6 -- continued

a Patients with at least one claim with a diagnosis code of psoriasis or PPP where the department was specified as dermatology or rheumatology during the 12-month observation period.

b Patients with a diagnosis code of psoriasis or PPP where the department was specified as other specialty but not as dermatology or rheumatology.

c Patients with diagnosis code of psoriasis or PPP where the department was not specified.

d Number of patients with a diagnosis code of the concurrent disease (diabetes mellitus, hyperlipidemia or hypertension) at least in one claim as well as a drug to treat the concurrent disease in the claims issued in 2 or more different months.

e Prevalence was standardized to the distribution of age and sex in the entire study population of 565,903 subjects as in Table 4 in the text.

f Difference of the standardized prevalence between the severity classes I, II and IV and the severity class III (topical treatment only) in each department subgroup.

PPP, palmoplantar pustulosis; CI, confidence interval.

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract It is indicated that the study is a nationwide study using database though the term "cross-sectional" itself is not used
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found In the abstract, the study is summarized in an informative and balanced way.
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported Epidemiology of psoriasis/ palmoplantar pusutulosis (PPP) in the Western countries and Asia are outlined and the current status of the secondary use of National Database in Japan is mentioned.
Objectives	3	State specific objectives, including any prespecified hypotheses This study is descriptive and the objective "to study national prevalence of psoriasis and PPP" is given clearly.
Methods		
Study design	4	Present key elements of study design early in the paper It is given that we did a descriptive study using database covering whole nation
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection It is given that data for 12-month period (with specified dates) was extracted from Japanese national database to obtain data of patients with psoriasis/PPP.
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants It is given that all the patients were identified by the ICD-10 diagnosis code.
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable This is the descriptive study and all the attributes of the patients examined including age, sex, use of health care service, treatments for psoriasis/PPP, comorbidities are specified.
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group All the data were obtained from the database and codes for diagnoses, drugs and other treatments used in the study are specified.
Bias	9	Describe any efforts to address potential sources of bias One of major possible biases is misclassification of psoriasis/PPP particularly when the diagnosis was made by non-specialist. It is given that we collected the specialty of the department in a claim with a diagnosis code of psoriasis and PPP issued from a hospital or clinic.
Study size	10	Explain how the study size was arrived at We did not give sample size calculation as this is the descriptive study to estimate national prevalence of psoriasis/PPP using database covering the whole nation.
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why

		We gave how quantitative variables were handled clearly in the section of statistical analysis including subgroups used in the study.
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding In the comparison of comorbidities between subclasses according to severity, in the supplementary tables, we stratified the data by the specialty of the department. It is also clearly given that we used McNemar test to examine the seasonal variation of the use of health care service.
		(*b*) Describe any methods used to examine subgroups and interactions It is given that we examined subgroups classified by the specialty of the department.
		(*c*) Explain how missing data were addressed In this study using the national database, no information is available suggesting potential missing variables and the issue of missing data is not addressed.
		(*d*) If applicable, describe analytical methods taking account of sampling strategy The study is to cover the whole nation and this issue is not applicable.
		(*e*) Describe any sensitivity analyses In this descriptive study, no sensitivity analysis is conducted.
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed In this study using national database, there was no "stage" which might be seen in the study using the primary data.
		(b) Give reasons for non-participation at each stage In this database study, no non-participation occurred.
		(c) Consider use of a flow diagram Due to the nature of the study, we did not judge it is needed to use a flow diagram.
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders We gave the basic characteristics in Table 1 and Figure 1.
		(b) Indicate number of participants with missing data for each variable of interest In this study, no information is available suggesting potential missing variables and we could not show the number of subjects with missing data.
Outcome data	15*	Report numbers of outcome events or summary measures Though this study is descriptive, comorbidity may be regarded as one of "outcomes" and the number is summarized in Table 4.
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included Estimates of the proportion are given with 95% confidence interval. As "confounding" is not an issue in this study, no data after "adjustment" is shown though we showed results when stratified by the specialty of the department and other variables used to make subclasses.
		(*b*) Report category boundaries when continuous variables were categorized This occurred for age which was given as 5-year age band and the boundaries are clearly given in the manuscript.
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period

		In this descriptive study, this issue of relative/absolute risk is not relevant.
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses In supplementary tables, the results in subgroups subdivided by the specialty of the department with or without further stratification by the additional variable (e.g., severity of disease) are shown.
Discussion		
Key results	18	Summarise key results with reference to study objectives Main result or prevalence of psoriasis/PPP is summarized.
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias Main limitation due to the lack of validation study is emphasized.
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence Interpretation is made cautiously particularly we recognize that the study has limitations. Comparison with other studies so far conducted is made.
Generalisability	21	Discuss the generalisability (external validity) of the study results As the study used the data covering whole nation, generalizability is not an issue.
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based The source of funding and the role of the funders is clearly given in the section of "Funding" given after REFERENCES.

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.