

# Global Epidemiology of Psoriasis: A Systematic Review of Incidence and Prevalence

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The worldwide incidence and prevalence of psoriasis is poorly understood. To better understand this, we performed a systematic review of published population-based studies on the incidence and prevalence of psoriasis. Three electronic databases were searched from their inception dates to July 2011. A total of 385 papers were critically appraised; 53 studies reported on the prevalence and incidence of psoriasis in the general population. The prevalence in children ranged from 0% (Taiwan) to 2.1% (Italy), and in adults it varied from 0.91% (United States) to 8.5% (Norway). In children, the incidence estimate reported (United States) was 40.8/100,000 person-years. In adults, it varied from 78.9/100,000 person-years (United States) to 230/100,000 person-years (Italy). The data indicated that the occurrence of psoriasis varied according to age and geographic region, being more frequent in countries more distant from the equator. Prevalence estimates also varied in relation to demographic characteristics in that studies confined to adults reported higher estimates of psoriasis compared with those involving all age groups. Studies on the prevalence and incidence of psoriasis have contributed to a better understanding of the burden of the disease. However, further research is required to fill existing gaps in understanding the epidemiology of psoriasis and trends in incidence over time.

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## INTRODUCTION

Psoriasis is a chronic, immune-mediated inflammatory skin disease. It ranges in severity from a few scattered red, scaly plaques to involvement of almost the entire body surface. It may progressively worsen with age, or wax and wane in its severity; the degree of severity depends on inheritance and environmental factors (Lebwohl, 2003). Psoriasis causes considerable psychosocial disability and has a major impact on patients' quality of life (Rapp *et al.*, 1999). The cost to both patients and health-care systems is high (Javitz *et al.*, 2002). Psoriasis is associated with cardiovascular disease, depressive illness, and psoriatic arthritis (Griffiths and Barker, 2007). The causes of psoriasis are not fully understood, but a number of risk factors are recognized, including family history and environmental risk factors, such as smoking, stress, obesity, and alcohol consumption (Huerta *et al.*, 2007).

Psoriasis is estimated to affect about 2–4% of the population in western countries (Stern *et al.*, 2004; Gelfand *et al.*, 2005b;

Kurd and Gelfand, 2009). Important factors in the variation of the prevalence of psoriasis include age, gender, geography, and ethnicity, probably due to genetic and environmental factors. Higher prevalence rates have been reported at higher latitudes, and in Caucasians compared with other ethnic groups (Farber and Nall, 1998). In addition, the wide variation in prevalence estimates may be influenced by aspects of psoriasis such as its remitting–relapsing course, diversity of clinical presentations (Griffiths *et al.*, 2007), and variation in severity (Griffiths and Barker, 2007). Aspects of study design may also be important. These include different definitions of prevalence, case definitions (Gelfand *et al.*, 2005b), sampling frames and methods, and age groups studied.

Although several studies, dating back to the 1960s–1970s, have reported the prevalence of psoriasis (Lomholt, 1964; Hellgren, 1967; Rea *et al.*, 1976; Johnson and Roberts, 1978), incidence studies are few, probably because of the difficulty in accurately identifying and documenting such cases.

Despite a number of narrative reviews of the epidemiology of psoriasis (Farber and Nall, 1998; Plunkett and Marks, 1998; Christophers, 2001; Naldi, 2004; Neimann *et al.*, 2006; Gudjonsson and Elder, 2007; Chandran and Raychaudhuri, 2010), a systematic review has not been performed. Furthermore, many of the earlier reviews included studies that combined data from general population, hospital, or dermatology clinics with no clear distinction in the results, and no review has looked at the variation of psoriasis according to age and method of case definition. Therefore, the aim of this systematic review was to evaluate the

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Abbreviation: CI, confidence interval

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prevalence and incidence of psoriasis from studies in the general population and to explore variations in epidemiology on the basis of geographical location, age, and, where possible, on study design (survey, primary-care data, or other registries), case definition (self-reported, physician's, or dermatologist's diagnosis), and definition of prevalence (lifetime, period, or point prevalence).

## RESULTS

Supplementary Figure S1 online summarizes the results of the search strategy. Papers were mainly excluded from the search because (i) they did not provide any measure of prevalence or incidence of psoriasis, (ii) subjects were identified from dermatology clinics, and (iii) the study focused on specific subgroups of the population. In all, we identified 46 studies that reported on the prevalence of psoriasis (Supplementary Tables S1–S3 online) and 7 studies that focused on the incidence of psoriasis in the general population (Table 1).

### Prevalence of psoriasis

Most studies of the prevalence of psoriasis were conducted in Europe or United States, but there were also studies from Australia, China, Egypt, Latin America, Sri Lanka, Taiwan, and Tanzania. Key differences in prevalence rates depended on whether the study population included only children, only adults, or individuals of all ages, as well as on the underlying age and sex structure of the whole population. Further variation was related to the following: the definition of prevalence, such as point (15 studies), period (9 studies), or lifetime (19 studies); methodology used, such as survey (30 studies), administrative database (11 studies), or insurance database (4 studies); and case definition, such as self-report, physician's, or dermatologist's diagnosis.

### Prevalence of psoriasis in children

Six studies reported the prevalence of psoriasis in children (defined as those aged <18 years) in Europe or Asia (Figure 1). In general, the prevalence of psoriasis in children was up to 0.71% in Europe (Augustin *et al.*, 2010) and almost absent in Asia (Yang *et al.*, 2007; Chen *et al.*, 2008). One exception was a study of 13- to 14-year-old children in Italy that found a lifetime prevalence of dermatologist diagnosed psoriasis of 2.15% (95% confidence interval (CI): 1.59–2.61) (Naldi *et al.*, 2009). A German study, based on an insurance database and confined to those aged under 18 years, reported a low overall prevalence of psoriasis in children (0.71% (95% CI: 0.68–0.74)) and an increasing prevalence with age (0.37% for 0–9 years and 1.01% for 10–18 years) (Augustin *et al.*, 2010) (Supplementary Table S1 online). Not surprisingly, studies based on lifetime prevalence generally yielded higher estimates than those based on point prevalence.

### Prevalence of psoriasis in adults

Studies of the prevalence of psoriasis in adults (Figure 2) yielded higher prevalence estimates than studies in children. However, there appeared to be little consistency within or between countries. In Europe, the United Kingdom had one of the lowest and most consistent estimates, probably due to the

same methodology (primary-care database). Here, prevalence of psoriasis in adults was estimated as 1.30% (95% CI: 1.21–1.39) (O'Neill and Kelly, 1996), 2.60% (95% CI: 2.47–2.78) (Kay *et al.*, 1999), and 2.20% (95% CI: 2.19–2.21) (Seminara *et al.*, 2011), respectively. A study from Croatia in the late 1980s reported a psoriasis prevalence (1.21% (95% CI: 0.95–1.47)) similar to that of the United Kingdom (Barisic-Drusko *et al.*, 1989). Other countries, in North-East and South Europe, reported higher values than the United Kingdom, specifically of 3.73% (95% CI: 3.13–4.32) in Denmark (Brandrup and Green, 1981), 4.82% (95% CI: 4.47–5.17) (Kavli *et al.*, 1985) and 8.50% (95% CI: 8.03–8.97) in Norway (Bo *et al.*, 2008), 3.10% (95% CI: 2.54–3.66) in Italy (Naldi *et al.*, 2004), and 5.20% (95% CI: 4.68–5.72) in France (Wolkenstein *et al.*, 2009).

Estimates of prevalence of psoriasis in Australia ranged from 2.30% (95% CI: 1.39–3.21) to 6.6% (95% CI: 5.4–7.9) (Quirk, 1979; Kilkenny *et al.*, 1998; Plunkett *et al.*, 1999), whereas rates in United States ranged from 2.2% (95% CI: 2.0–2.4) to 3.15% (95% CI: 2.60–3.70) (Stern *et al.*, 2004; Kurd and Gelfand, 2009) and were similar to those from United Kingdom. Exceptions were two studies in the United States, one collecting data on African Americans and the other study from two medical insurance databases, which reported a prevalence of 1.3% (95% CI: 0.7–1.8) (Gelfand *et al.*, 2005a) and 0.91% (95% CI: 0.90–0.92) and 1.06% (95% CI: 1.05–1.07), respectively (Robinson *et al.*, 2006). Qureshi *et al.* (2009) reported a prevalence of psoriasis (2.58% (95% CI: 2.47–2.69)) only in women, which was consistent with other studies conducted in the United States (Stern *et al.*, 2004; Kurd and Gelfand, 2009).

Only in the reports from Europe it appeared that studies based on self-reported diagnoses had higher prevalence rates than physicians' diagnoses ((Brandrup and Green, 1981; Kavli *et al.*, 1985; O'Neill and Kelly, 1996; Kay *et al.*, 1999; Naldi *et al.*, 2004; Bo *et al.*, 2008; Wolkenstein *et al.*, 2009; Seminara *et al.*, 2011); Supplementary Table S2 online).

### Prevalence of psoriasis for individuals of all ages

On examining individuals of all ages, in Europe, prevalence rates varied between 0.73% (in Scotland) and 2.9% (in Italy). However, although most of the studies reported a prevalence above 1%; specifically 2.00% (95% CI: 1.86–2.14) in Sweden (Hellgren, 1967), 1.10% (95% CI: 0.11–2.09), 1.40% (95% CI: 0.94–1.86), and 1.40% (95% CI: 1.18–1.62) in Norway (Braathen *et al.*, 1989; Falk and Vandbakk, 1993), 2.84% (95% CI: 2.53–3.15) in Denmark (Lomholt, 1964), 1.58% (95% CI: 0.00–3.35) in Yugoslavia (Arzenek *et al.*, 1984), 1.48% (95% CI: 1.20–1.80), 1.52% (95% CI: 1.51–1.53), and 1.87% (95% CI: 1.89–1.91) in United Kingdom (Nevitt and Hutchinson, 1996; Gelfand *et al.*, 2005b; Seminara *et al.*, 2011), 1.43% (95% CI: 1.23–1.63) in Spain (Ferrandiz *et al.*, 2001), 2.90% (95% CI: 2.39–3.41) in Italy (Saraceno *et al.*, 2008), and 2.00% (95% CI: 1.98–2.20) and 2.53% (95% CI: 2.50–2.56) in Germany (Schlander *et al.*, 2008; Augustin *et al.*, 2010), two studies from Scotland and United Kingdom showed lower estimates of psoriasis equal to 0.73% (95% CI: 0.69–0.76) (Simpson *et al.*, 2002) and

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