

# Burden of disease and treatment patterns in patients with vitiligo: findings from a national longitudinal retrospective study in the UK

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## Abstract

**Background** UK studies examining vitiligo burden and vitiligo-related healthcare resource utilization (HCRU) are lacking.

**Objective** To describe the incidence and prevalence of vitiligo, the demographic and clinical characteristics of patients with vitiligo, vitiligo burden, HCRU, incidence of mental health comorbidities and management strategies, including treatment patterns.

**Methods** This retrospective study used UK Clinical Practice Research Datalink and Hospital Episode Statistics databases to analyse patients with vitiligo from 1 January 2010 to 31 December 2021.

**Results** Among 17 239 incident patients, mean incidence of vitiligo was 0.16 (2010–2021) per 1000 person-years [PY; range 0.10 (2020–COVID-19) to 0.19 (2010/2013/2018)]; among 66 217 prevalent patients, prevalence increased from 0.21% (2010) to 0.38% (2021). The most common comorbidities recorded after vitiligo diagnosis were diabetes (19.4%), eczema (8.9%), thyroid disease (7.5%) and rheumatoid arthritis (6.9%). Mental health diagnoses recorded at any time included depression and/or anxiety (24.6%), depression (18.5%), anxiety (16.0%) and sleep disturbance (12.7%), and recorded after vitiligo diagnosis in 6.4%, 4.4%, 5.5% and 3.9%, respectively. Mental health comorbidities were more common in White (e.g. depression and/or anxiety 29.0%) than in Black (18.8%) and Asian (16.1%) patients. In adolescents, depression and/or anxiety was most commonly diagnosed after a vitiligo diagnosis than before (7.4% vs. 1.8%). Healthcare resources were used most frequently in the first year after vitiligo diagnosis (incident cohort), typically dermatology-related outpatient appointments (101.9/100 PY) and general practitioner consultations (97.9/100 PY). In the year after diagnosis, 60.8% of incident patients did not receive vitiligo-related treatment (i.e. topical corticosteroids, topical calcineurin inhibitors, oral corticosteroids or phototherapy), increasing to 82.0% the next year; median time from diagnosis to first treatment was 34.0 months (95% confidence interval 31.6–36.4). Antidepressants and/or anxiolytics were recorded for 16.7% of incident patients in the year after diagnosis. In 2019, 85.0% of prevalent patients did not receive vitiligo-related treatments.

**Conclusion** Most patients were not on vitiligo-related treatments within a year of diagnosis, with the time to first treatment exceeding 2 years, suggesting that vitiligo may be dismissed as unimportant. New effective treatments, early initiation and psychological intervention and support are needed to reduce the vitiligo burden on patients.

## Lay summary

Vitiligo is a chronic disease in which cells that produce the skin pigment called melanin are attacked, resulting in white or pale patches of skin. It is diagnosed in an estimated 0.2–0.8% of people in Europe.

This study aimed to describe how many new cases of vitiligo were recorded between 2010 and 2021 in the UK and the overall percentage of people with vitiligo. Linked national general practitioner (GP) and hospital-based records containing information on medical diagnoses, admissions and hospital visits were used. Records of other diseases and conditions, including mental health conditions, in combination with healthcare service use and treatment prescribed to patients with vitiligo, were studied to describe the impact of living with vitiligo.

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It was found that 0.16 new cases of vitiligo were recorded per 1000 person-years (for example, 0.16 new cases would have been recorded if 1000 people were followed for 1 year or if 100 people were all followed for 10 years) between 2010 and 2021. In 2021, 0.4% of the population studied had vitiligo. In the 5 years after a new diagnosis of vitiligo, the most common other diseases recorded were diabetes (19%), eczema (9%), thyroid disease (8%) and rheumatoid arthritis (7%), and the most common mental health conditions were depression and/or anxiety (25%). In the year after diagnosis, GP and dermatology outpatient visits were the most common type of medical services used. In 2019, 85% of all individuals with vitiligo were not receiving any vitiligo-related treatment (such as creams or phototherapy). It took approximately 34 months from diagnosis of vitiligo to the start of first treatment. The results suggest that new effective treatments and psychological interventions are needed to reduce the burden of vitiligo.

### What is already known about this topic?

- The prevalence of diagnosed vitiligo is estimated to be between 0.2% and 0.8% in Europe.
- The burden of disease is considerable – vitiligo can have a profound impact on an individual's psychosocial wellbeing and quality of life.
- Patients with vitiligo are often affected by other autoimmune disorders and mental health conditions.
- Studies examining the burden of vitiligo on patients and the healthcare system in the UK are lacking.

### What does this study add?

- From UK Clinical Practice Research Datalink and Hospital Episode Statistics databases, the incidence of vitiligo was calculated to be 0.16/1000 person-years; prevalence in 2021 was 0.38%.
- In 2019, 85.0% of prevalent patients had no record of vitiligo-related treatment.
- Median time to first vitiligo-related treatment was 34 months (incident cohort) after diagnosis (most commonly topical and oral corticosteroids, and topical calcineurin inhibitors).
- In the year after diagnosis, 16.7% of incident patients were treated with antidepressants and/or anxiolytics.

Vitiligo is a chronic autoimmune disease characterized by the selective loss of melanocytes, resulting in patches of skin depigmentation.<sup>1,2</sup> Data on the incidence of vitiligo are scarce; in Europe, the prevalence rate of diagnosed vitiligo ranges from 0.2% to 0.8%, with geographical and methodological differences.<sup>1,3,4</sup>

Vitiligo can have a profound impact on the psychosocial wellbeing and quality of life (QoL) of patients.<sup>5–9</sup> Furthermore, comorbid autoimmune disorders and mental health diagnoses can further affect wellbeing and QoL.<sup>5–9</sup> The prevalence of vitiligo comorbidities in the UK has not been investigated.

In chronic disease, increased healthcare resource utilization (HCRU) is associated with financial loss (e.g. disease-related lost work hours), contributing to disease burden. Information captured by the Clinical Practice Research Datalink (CPRD) Aurum and Hospital Episode Statistics (HES) databases include patient demographics, medical diagnoses, drug exposure, procedures, laboratory and pathology test results, hospital and specialist referrals, details of admissions, emergency attendances and outpatient appointments at National Health Service (NHS) hospitals in England. Together, these data can be used to assess disease burden and disease-associated HCRU.

UK studies examining vitiligo burden and vitiligo-related HCRU are lacking. This longitudinal retrospective descriptive study, using large national UK clinical databases, describes the incidence and prevalence of vitiligo, the demographic and clinical characteristics of patients with vitiligo and vitiligo burden. HCRU, incidence of mental health comorbidities

and management strategies, including treatment patterns, are described.

## Patients and methods

### Study design and patients

This retrospective study used data from the CPRD database that was linked to the HES database. CPRD Aurum contains data collected since 1995 and covers approximately 40 million patients (historic and current), including approximately 13 million patients currently registered with a general practitioner (GP).

The incident cohort included patients with a vitiligo diagnosis in the CPRD database who were aged  $\geq 12$  years at the time of first vitiligo diagnosis; the prevalence cohort included those aged  $\geq 12$  years during the study period. Exclusion criteria included a diagnosis of vitiligo due to pinta or as part of a congenital disorder, vitiligo of the iris or occupational vitiligo. The overall study period was from 1 January 2010 to 31 December 2021.

### Objectives

The primary objectives of this study were to: (i) determine the annual incidence and prevalence of vitiligo for each year from 2010 to 2021; (ii) describe the demographic and clinical characteristics of patients first diagnosed with vitiligo (2010–2019), including comorbidities; and (iii) describe

treatment patterns, including time from diagnosis to treatment initiation and HCRU from 2010 to 2019 for UK patients with vitiligo.

## Endpoints and analyses

### *Incidence and prevalence cohorts*

Annual incidence and prevalence rates were calculated for 2010 to 2021, with incidence being the rate of incident vitiligo diagnoses within each calendar year and prevalence calculated as the point prevalence on 1 January of each year. For the incident cohort, the index date was the date of vitiligo diagnosis; patients were followed until practice registration end date, last practice collection date, end of study period for the specific endpoint or patient death – whichever occurred first. Patients lost to follow-up were censored from the date of loss onward. The annual incidence for each calendar year was calculated as the number of patients aged  $\geq 12$  years with a new diagnosis of vitiligo in that calendar year divided by the person-time at risk (i.e. total period within the year that patients were aged  $\geq 12$  years) within that year and reported as incidence per 1000 person-years (PY). The point prevalence of vitiligo was calculated on 1 January of each year (2010–2021) as all patients aged  $\geq 12$  years with a pre-existing vitiligo diagnosis on or before 1 January and still registered with a contributing GP at that time divided by the total number of patients registered with a contributing GP on that date.

### *Demographics and clinical characteristics*

Demographic and clinical characteristics at the time of vitiligo diagnosis were described for incident cases only, as were comorbidities in the 5 years before and after diagnosis. The patient journey and disease burden were assessed by HCRU (reported per 100 PY), the incidence of mental health comorbidities and the time from diagnosis until the initiation of vitiligo-related treatment.

### *Healthcare resource utilization*

HCRU was assessed as vitiligo-related primary care consultations (in-person and telephone) with GPs, nurses and other healthcare professionals and dermatology-related hospital events (i.e. inpatient admissions, outpatient visits and accident and emergency visits). Treatment patterns were identified using prescription or treatment records, which were used to estimate the time between initial diagnosis and start of the first, second and third vitiligo-related treatments.

### *Treatment patterns*

Prescription or treatment records of interest were categorized as vitiligo-related treatments [i.e. topical calcineurin inhibitors (TCIs), topical corticosteroids (TCS), oral corticosteroids, light therapies (including narrowband ultraviolet B phototherapy and psoralen ultraviolet A photochemotherapy) and laser therapies] and non-vitiligo-related treatments (i.e. all treatment records other than vitiligo-related), adjuvant management strategies (i.e. sunscreen, vitamin D, camouflage prescription, referral to camouflage services and referral to dermatologists) and psychological management strategies (i.e. antidepressants, anxiolytics and psychological intervention referrals). For reporting of HCRU

and treatment use by calendar year, prevalent patients were those with follow-up data available in that particular year. The analysis of treatment patterns over time (i.e. Sankey analysis) included incident patients who were included in the HES outpatient database (a database containing records of light therapy) and diagnosed no later than 31 December 2018, to allow for a potential 1-year minimum follow-up period. Treatment events (defined as a change in treatment) were identified up to the fourth event. At the end of follow-up, if patients did not have four treatment events, their final event was recorded as 'no further treatment, < 18 months since last treatment' or 'no further treatment,  $\geq 18$  months since last treatment record'. A period of 18 months without any treatment record was recorded as a 'treatment gap'. All analyses were descriptive.

## Results

### Patients and disposition

A total of 104 001 patients with vitiligo were identified in the CPRD database between 1 January 1995 and 31 December 2021. After excluding patients with missing or inconsistent data, those with a first vitiligo diagnosis before 1 January 2010 and those aged < 12 years at diagnosis, the incident cohort included 17 239 patients with a recorded first diagnosis of vitiligo between 1 January 2010 and 31 December 2019 (Figure S1a; see [Supporting Information](#)). The prevalent cohort included 66 217 patients with a recorded pre-existing diagnosis of vitiligo on 1 January of any year between 2010 and 2021 in patients aged  $\geq 12$  years (Figure S1b; see [Supporting Information](#)).

Of the 17 239 incident patients, 52.2% were female (Table 1). The median age of patients was 41.9 years (range 12–99); 9.4% were adolescents (i.e. aged 12–17 years);

**Table 1** Patient demographics and clinical characteristics of the incident cohort

Characteristic	Incident cohort (n = 17 239)
Age (years), median (range)	41.9 (12–99)
Adults ( $\geq 18$ years old)	15 623 (90.6)
Adolescents (12–17 years old)	1616 (9.4)
Female	8992 (52.2)
Race <sup>a,b</sup>	
White	10 967 (65.6)
Black	1165 (7.0)
Asian	3542 (21.2)
Other	1053 (6.3)
BMI category <sup>a,c</sup>	
Underweight	182 (3.1)
Healthy weight	2018 (34.4)
Overweight	2047 (34.9)
Obese	1617 (27.6)
Smoking status <sup>a,d</sup>	
Nonsmoker	2541 (33.5)
Ex-smoker	2805 (37.0)
Current smoker	2242 (29.5)

Data are presented as n (%) unless otherwise stated. BMI, body mass index. <sup>a</sup>Percentages based on those with available data; <sup>b</sup>data on race were not available for 512 patients; <sup>c</sup>data on BMI were not available for 11 375 patients; <sup>d</sup>data on smoking status were not available for 9651 patients.

65.6% were White, followed by Asian (21.2%) and Black (7.0%). At the time of vitiligo diagnosis, among those with data available, 62.5% of the incident cohort were obese or overweight; 29.5% were current smokers.

### Incidence and prevalence

The incidence of vitiligo remained relatively stable at approximately 0.2 per 1000 PY (mean 0.16; range 0.16–0.19) between 2010 and 2019 (Figure 1a). During 2020 (the first year of the COVID-19 pandemic), the annual incidence decreased to 0.10 per 1000 PY. The prevalence of vitiligo showed a gradual increase between 2010 and 2021, rising from 0.21% in 2010 to 0.38% in 2021 (Figure 1b).

### Comorbidities

In the 5 years after vitiligo diagnosis, the most common comorbidities recorded in the 17 239 incident patients were diabetes (19.4%), eczema (8.9%), thyroid disease (7.5%) and rheumatoid arthritis (6.9%; Figure 2).

The most common mental health comorbidities in the incident cohort recorded at any time were depression (18.5%) and anxiety (16.0%), with depression and/or anxiety recorded in 24.6% of patients (Figure S2; see Supporting Information), including new cases recorded after a vitiligo diagnosis in 4.4%, 5.5% and 6.4%, respectively. Sleep disturbance and risk of suicide (including attempts, thoughts, risk score or self-harm) at any time were reported in 12.7% and 7.1% of patients, respectively, including new cases recorded after a vitiligo diagnosis in 3.9% and 3.2%, respectively. Mental health comorbidities were more common in White patients than their counterparts (Figure S2b; see Supporting Information). For example, depression and/or anxiety at any time was diagnosed in 29.0% of White patients vs. 18.8% of Black and 16.1% of Asian patients, and 21.4% of patients of other ethnicities. Mental health comorbidities were recorded more commonly in female (30.2%) than in male patients (18.5%). In contrast to findings in adults, depression and/or anxiety mostly occurred after a vitiligo diagnosis in adolescents [7.4% vs. 1.8% (Figure S2c; see Supporting Information)].

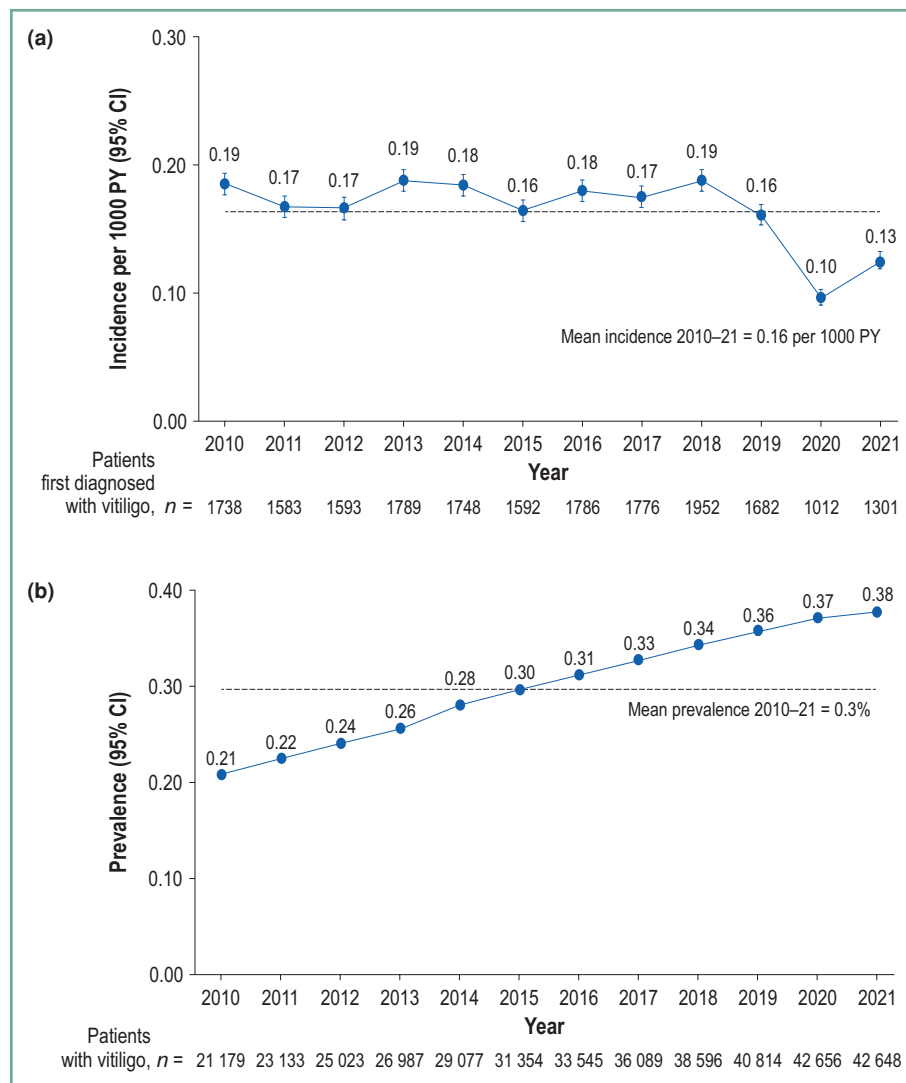
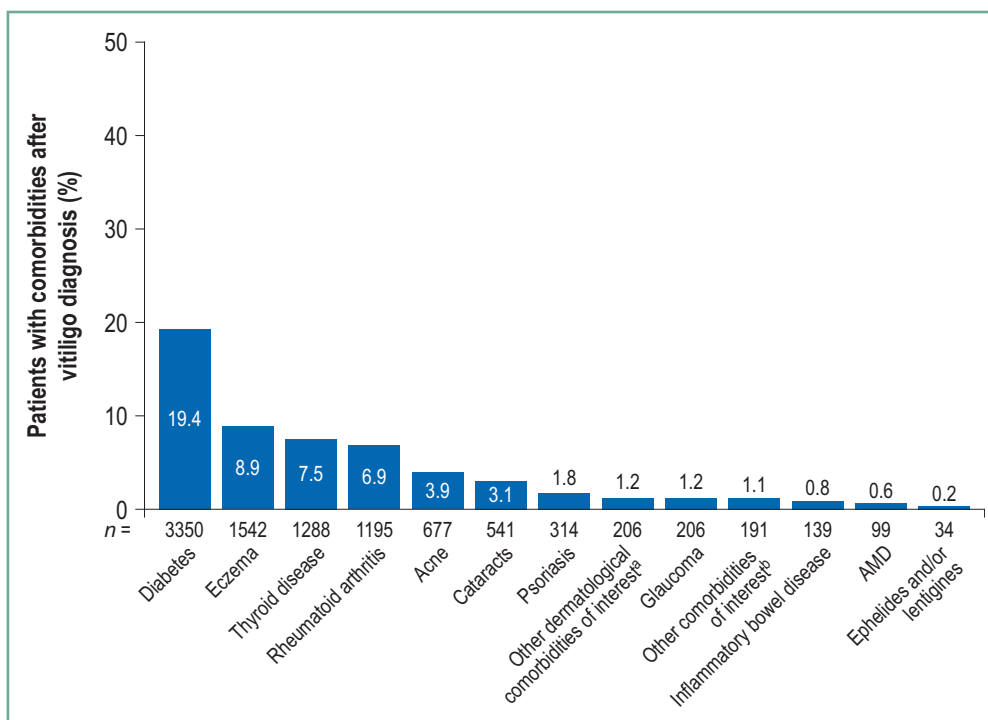


Figure 1 (a) Incidence and (b) prevalence of vitiligo. CI, confidence interval; PY, person-years.



**Figure 2** Comorbidities in the incident cohort following a diagnosis of vitiligo. AMD, age-related macular degeneration. <sup>a</sup>Other dermatological comorbidities included alopecia areata and lichen planus; <sup>b</sup>other comorbidities included myasthenia gravis, pernicious anaemia, systemic lupus erythematosus, Guillain-Barré syndrome, Sjögren syndrome and Addison disease.

### Healthcare resource utilization

In the first year after a vitiligo diagnosis, the rates of outpatient (101.9/100 PY) and GP appointments (97.9/100 PY) were the highest for any of the 5 years after diagnosis (Figure S3a; see Supporting Information). In the fifth year, outpatient appointments and GP consultations per 100 PY declined to 51.6 and 3.0, respectively.

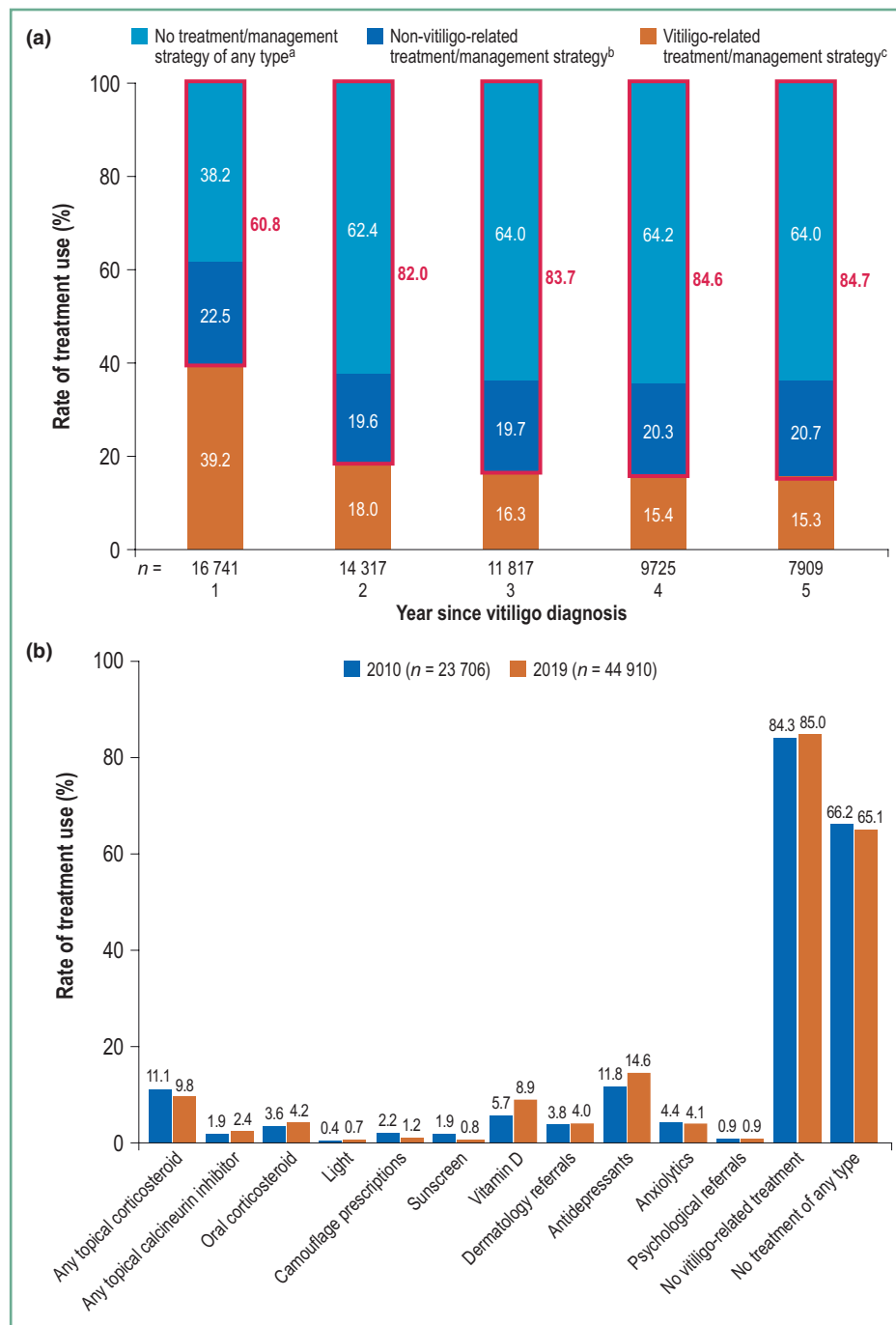
In 2010, among prevalent patients with follow-up data in the specific year being analysed, dermatology-related hospital events were the most frequently used healthcare resource (8497 events; 39.8/100 PY), most of which were outpatient appointments (8299 events; 38.9/100 PY), with the remainder being inpatient admissions (151 events; 0.7/100 PY) and accident and emergency visits (47 events; 0.2/100 PY). In 2010, the rate of vitiligo-related primary care consultations was 12.7 per 100 PY (2717 events), most of which were face-to-face GP appointments (2356 events; 11.0/100 PY; 86.7% of vitiligo-related primary care consultations), the remainder being appointments with other healthcare professionals (361 events; 1.7/100 PY). In 2019, the rates of dermatology-related hospital events and vitiligo-related primary care consultations per 100 PY were 43.2 and 6.5, respectively (Figure S3b; see Supporting Information).

### Management strategy patterns

In the first year after diagnosis, 60.8% of the 16 741 incident patients with data linked to the HES outpatient database had no record of any vitiligo-related treatments, which increased to  $\geq 82.0\%$  from the second year onward (Figure 3a). Of the HES-linked incident patients, in the first year,

patients were recorded as having been prescribed TCS (29.1%), TCIs (11.8%) and oral corticosteroids (4.2%). From the second year onward, the percentage of patients prescribed oral corticosteroids remained stable, while prescription of TCS and TCIs declined to 11.4% and 3.9% in the second year, respectively, remaining low thereafter. In the first year after vitiligo diagnosis, 16.7% of patients were prescribed antidepressants and/or anxiolytics; prescription rates remained relatively stable across each of the 5 years following diagnosis.

Among prevalent patients with follow-up data in 2010, 66.2% of patients had no record of any treatments and 84.3% were not receiving any vitiligo-related treatments; TCS were prescribed for 11.1%, oral corticosteroids for 3.6% and TCIs for 1.9% (Figure 3b). In 2010, the most frequently recorded adjuvant management strategies were vitamin D (5.7%), dermatology referrals (3.8%) and camouflage prescriptions (2.2%); antidepressants and/or anxiolytics, antidepressants and anxiolytics were prescribed for 14.4%, 11.8% and 4.4% of patients, respectively; 0.9% had a record of a psychological referral. In 2019, 65.1% of prevalent patients with follow-up data had no record of any treatments either vitiligo-related or otherwise, and 85.0% were not prescribed any vitiligo-related treatments; TCS were prescribed for 9.8% of patients, oral corticosteroids for 4.2% and TCIs for 2.4%. In the same year, the most frequently recorded adjuvant management strategies were vitamin D (8.9%), dermatology referrals (4.0%) and camouflage prescriptions (1.2%); antidepressants and/or anxiolytics, antidepressants and anxiolytics were prescribed for 16.6%, 14.6% and 4.1% of patients, respectively; 0.9% had a record of a psychological referral.



**Figure 3** Vitiligo-related treatment/management strategy use in (a) the 5 years after a vitiligo diagnosis in the incident cohort and (b) calendar years 2010 and 2019 in prevalent patients (follow-up in the relevant year). Red box and associated numbers denote the percentage of patients not on any vitiligo-related treatments. <sup>a</sup>No vitiligo-related or non-vitiligo-related treatments or management strategies. <sup>b</sup>Non-vitiligo-related treatment/management strategies included psychological management strategies (i.e. antidepressants and/or anxiolytics and psychological referrals) and adjuvant management strategies (i.e. camouflage prescription, sunscreen, vitamin D, camouflage referrals and dermatology referrals). <sup>c</sup>Vitiligo-related treatments/management strategies included topical corticosteroids, topical calcineurin inhibitors, oral corticosteroids and light and laser therapy.

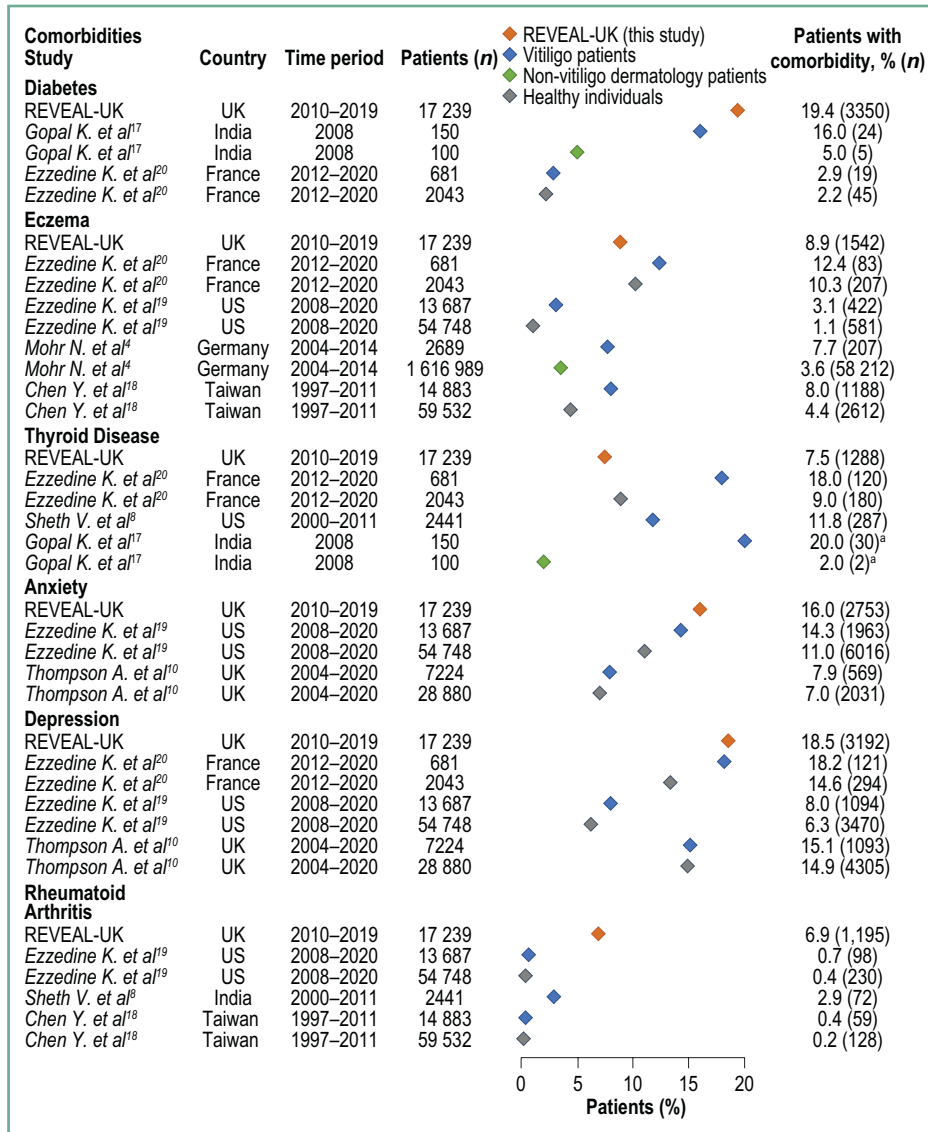
**Time to first treatment**

In the incident cohort, 8679 (51.8%) patients had one or more vitiligo-related treatment recorded during follow-up. Median duration from diagnosis to the first record of a vitiligo-related treatment was 34.0 months [95% confidence interval (CI) 31.6–36.4] months. After 1 year, 40.1% had a first vitiligo-related treatment record. Of the 8679 patients with a first vitiligo-related treatment record, 2990 (34.5%) had a second vitiligo-related treatment record; 1265 of these

patients (42.3%) had a third vitiligo-related treatment record. Median time from diagnosis to the second and third vitiligo-related treatment was 84.4 (95% CI 80.5–89.3) and 88.5 (95% CI 82.5–93.7) months, respectively.

**Gaps in treatment**

Overall, of the 15 105 HES-linked incident patients diagnosed before 31 December 2018, 8081 had one or more prescription or treatment record. Of these patients, 6549



**Figure 4** Comorbidities in the incident cohort and other study populations. Time window for assessing comorbidities may vary between studies. Comparator studies investigating similar comorbidities in patients with vitiligo were found via PubMed, searching publicly available reports including relevant key words for each comorbidity paired with ‘vitiligo comorbidities’; our study did not distinguish between type 1 and type 2 diabetes; for comparator studies we did not include those studies reporting type 1 diabetes only. <sup>a</sup>Hypothyroidism only.

(81.0%) had no further treatment or a treatment gap of  $\geq 18$  months (Figure S4; see Supporting Information). Of the 5313 patients (65.7%) who were first prescribed TCS, 1008 (19.0%) had a recorded treatment gap following their first treatment. Among patients who had two or more treatment events, no clear treatment trends were identified, with small numbers of patients switching from any given treatment to another.

**Discussion**

Published data on the incidence of vitiligo are lacking; therefore, this study is a meaningful contribution to the description of the epidemiology of vitiligo in the UK. The prevalence of diagnosed vitiligo in the UK reported here falls within European estimates obtained from surveys or medical screenings, and is comparable to recent UK estimates

(approximately 0.3%) representing the prevalence of diagnosed vitiligo in patients registered with a GP.<sup>3,4,10</sup> As not all patients with vitiligo seek medical attention or treatment, the actual prevalence in the UK population may be higher than observed in this dataset.<sup>4</sup>

Generally, the characteristics of patients with vitiligo in this study are comparable with those of the general UK population, including the percentage of patients who were overweight or obese.<sup>11</sup> However, the percentage of UK patients with vitiligo who were Black, Asian or of mixed or other ethnicity was higher than that among the underlying UK population.<sup>12</sup> This aligns with previous reports that the prevalence of vitiligo is higher in patients with darker skin,<sup>13</sup> which could be because those with darker skin experience a greater burden of disease and are therefore more likely to seek medical care.<sup>14</sup> Current smoking status in our study (29.5%) was higher than that of the general UK population (13.3%).<sup>15</sup> Smoking has previously been associated with

other inflammatory skin disorders;<sup>16</sup> however, the high rate of missing data for smoking hinders definitive conclusions.

The presence of systemic and autoimmune comorbidities, as previously reported,<sup>8</sup> reinforces the autoimmune nature of vitiligo. Comorbidities in patients with vitiligo in our study were most often higher than those reported in individuals without vitiligo from other studies (Figure 4).<sup>4,8,10,17–20</sup> Mental health comorbidity rates were higher than rates observed in the general population (10% pre-COVID-19 pandemic), including higher than post-COVID-19 pandemic rates (21%).<sup>21</sup> Although the presence of mental health comorbidities cannot be attributed directly to vitiligo, these comorbidities add to the vitiligo-associated disease burden. Rates of reported mental health comorbidities varied by race, sex and age group (i.e. adolescents vs. adults). In contrast to the results of this study, surveys of the general population have found mental health diagnoses more infrequently in White people than in people of other ethnicities.<sup>22</sup> It is possible that inequalities in and barriers to accessing mental health services, as well as cultural stigma associated with mental health diagnosis among Black and minority ethnic populations in the UK, as observed with vitiligo,<sup>23</sup> have led to an under-representation of mental health diagnoses in these populations in our dataset. Nonetheless, the variance in mental health comorbidities across different demographic subgroups highlights the importance of tailored treatment approaches for vitiligo, including psychological assessment and intervention. Furthermore, to our knowledge, this study was unique in including adolescents, allowing for an improved understanding of the vitiligo burden in this age group in the UK.

This study showed that, in 2019, most prevalent patients (85%) were not prescribed any vitiligo-related treatments. The results are consistent with previously reported surveys of patients with vitiligo, which found that, for the majority of respondents, the priority was to find new effective treatments for lasting repigmentation, and that patients resorted to nonmedical sources (i.e. internet and support groups) to obtain information about vitiligo.<sup>14,24</sup> Further, our results reinforce the need for early intervention.<sup>25</sup> We found that the majority of patients were not prescribed any vitiligo-related treatment within a year of diagnosis and that there was a median delay of approximately 3 years between diagnosis and first vitiligo-related treatment, which means that for patients who do receive treatment, that treatment is delayed. This is in contrast with updated British Association of Dermatology guidelines for the management of people with vitiligo, which recommend early intervention.<sup>25</sup> Despite the fact that patients with vitiligo may not receive any vitiligo-related treatment, they may be prescribed antidepressants and anxiolytics (16.7% in the incident cohort) within the first year of the diagnosis. Future studies investigating age-related differences in treatment uptake could enhance understanding of patient behaviour and improve healthcare strategies across age groups.

The study limitations include that the data used to assess HCRU and treatment patterns did not contain information related to prescription fulfilment, over-the-counter treatments or private dermatologist appointments and prescriptions. Although this study lacks a control group, Figure 4 provides data from similar studies that investigated comorbidities in individuals with and without vitiligo. Additionally,

treatment records prescribed by hospital-based dermatologists were only available if the treatment was continued by a GP. Furthermore, limited capture of phototherapy procedures in the CPRD Aurum and HES outpatient databases may have resulted in an underestimation of phototherapy utilization (treatment and frequency). These limitations could restrict the generalizability of the data. Finally, the databases used did not include vitiligo-specific measurements to assess the extent of vitiligo or information on patient-reported outcomes and QoL such as the Vitiligo-Specific Quality-of-Life instrument (VitiQoL), patients aged < 12 years were not included, there was no control group and diagnoses of vitiligo may have been made by GPs rather than dermatologists.<sup>26</sup>

In summary, this is the first broad-based UK study to estimate the incidence and prevalence of vitiligo and mental health comorbidities in patients with vitiligo. Our study showed that there is a delay in medical treatment initiation and a low specialist referral rate, which suggests that patients with vitiligo receive suboptimal care compared with that outlined in recent guidelines.<sup>25</sup> In addition to the fact that treatments for vitiligo have variable success, lack of effective treatment contributes to the high disease burden on patients. Our study highlights that new, effective treatments and early treatment initiation, in combination with psychological intervention, are needed to reduce the disease burden in UK patients with vitiligo.

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## Conflicts of interest

V.E. has received honoraria and/or academic support from AbbVie, Almirall, Genesis Pharma, Incyte Corporation, La Roche-Posay, L'Oréal and Pfizer; is a scientific advisor for the UK Vitiligo Society; and is a Section Editor for the *BJD*. C.D. is an employee of and shareholder in Incyte Biosciences International. S.C.-M., C.L. and L.G.-R. are employees of IQVIA. I.K. has provided health economics consultancy under contract to Incyte Biosciences UK Ltd. A.M. is an employee and shareholder of Incyte Biosciences UK Ltd. A.R.T. has received honorarium and/or support with academic work over the last 12 months from Incyte, Pfizer, SALTS and UCB and is also a scientific advisor to the UK Vitiligo Society and a Trustee to the charity Changing Faces.



## Data availability

Access to individual participant-level data is not publicly available for this study.

## Ethics statement

The study protocol was approved by the Clinical Practice Research Datalink (CPRD) Research Data Governance process (protocol reference: 22\_001820). The study was performed in accordance with the Declaration of Helsinki and in adherence to the study protocol and local regulatory requirements.

## Supporting Information

Additional [Supporting Information](#) may be found in the online version of this article at the publisher's website.

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