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# Use of Glucagon-Like Peptide-1 Receptor Agonists in Danish Adolescents and Young Adults 2018–2025

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## ABSTRACT

**Objective:** Use of glucagon-like peptide-1 receptor agonists (GLP-1RAs) has increased rapidly following approval for obesity treatment, but data on their use in younger populations remain limited. We examined trends in GLP-1RA use among 12– to 24-year-olds in Denmark during 2018–2025.

**Methods:** Using nationwide prescription, hospital, and laboratory registries, we conducted a drug utilization study including all 12– to 24-year-olds who filled a GLP-1RA prescription between January 2018 and December 2025. We described incidence of use, baseline characteristics, prescribing patterns, and treatment persistence.

**Results:** GLP-1RA use rose more than 50-fold across the study period, reaching 418 new users per 100,000 by 2025, driven by semaglutide for weight management. Uptake was steepest among individuals aged 18–24 years (from 13 to 686 per 100,000) and more modest among adolescents aged 12–17 years (from 1.7 to 72 per 100,000). Most users were female, few had diabetes, and 33% had psychiatric comorbidity, particularly emotional and neurodevelopmental disorders. By 2025, 78% of new treatments were initiated in general practice. Only 38% were covered by a prescription after 1 year.

**Conclusions:** Findings demonstrate rapid uptake of GLP-1RAs in youth and the need for specialist involvement, long-term safety data, and careful evaluation of mental health in this population.

## 1 | Introduction

The use of glucagon-like peptide-1 receptor agonists (GLP-1RAs) has increased markedly in recent years following the 2021 approval of semaglutide for weight management outside of diabetes [1, 2]. In both Europe and the United States, GLP-1RAs are now approved for chronic weight management in adolescents aged ≥ 12 years with a body mass index (BMI) ≥ 95th percentile for age and sex and in adults with a BMI ≥ 30 kg/m$^2$ or ≥ 27 kg/m$^2$ in the presence of weight-related comorbidities, as an adjunct to lifestyle interventions. Randomized controlled trials have demonstrated substantial weight reductions for both adolescents and adults treated with newer GLP-1RAs such as semaglutide and tirzepatide, and phase III trials are currently under way in participants as young as 6 years [3–5].

However, real-world data on GLP-1RA use in younger populations remain limited [6–8]. Existing evidence is largely derived from adult populations, often restricted to middle-aged individuals, and generally suggests that weight losses in routine clinical practice are more variable than in trials, likely attenuated by lower adherence, high discontinuation rates,

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**Study Importance**

- What is already known?
  - Glucagon-like peptide-1 receptor agonists (GLP-1RAs) are increasingly prescribed for obesity treatment, but real-world data on GLP-1RA use in younger populations remain limited.
- What does this study add?
  - This nationwide study showed a >50-fold increase in GLP-1RA use among Danish 12– to 24-year-olds, largely driven by semaglutide for weight management. Most treatments were initiated by non-pediatric or non-endocrine specialists; psychiatric comorbidity was frequent, and treatment persistence was low.

and use of lower doses [9]. In addition, data on adverse effects in younger populations are also sparse, particularly regarding long-term safety.

Available evidence therefore provides limited insight into how GLP-1RAs are used in clinical practice among adolescents and young adults. In this nationwide study, we aimed to describe temporal trends in GLP-1RA use, as well as user characteristics and treatment persistence, among Danish adolescents and young adults between 2018 and 2025.

## 2 | Methods

In this descriptive drug utilization study, we used individual-level data from the Danish National Prescription Registry [10] to identify all individuals aged 12–24 years who filled at least one GLP-1RA prescription from January 1, 2018, to December 31, 2025. GLP-1RAs included exenatide (Anatomical Therapeutic Chemical code A10BJ01), liraglutide (A10BJ02), lixisenatide (A10BJ03), dulaglutide (A10BJ05), semaglutide (A10BJ06), and tirzepatide (A10BX16). Use of GLP-1RAs was further stratified into formulations indicated for type 2 diabetes (Victoza, Ozempic, and Rybelsus) and injections for weight management (Saxenda, Wegovy, Mounjaro). Prescription data were linked using unique individual identifiers to the Danish National Patient Register and the Danish Clinical Laboratory Information Register [11, 12].

We first described incident GLP-1RA users according to age, sex, potential treatment indications, comorbid conditions, GLP-1RA type, and prescriber specialty. For specific codes used, see Tables S1 and S2. Incident use was defined as a first-ever filled GLP-1RA prescription.

Second, we calculated annual and quarterly incidence rates per 100,000 persons using midyear population estimates as the denominator, stratified by age and drug class.

Third, we estimated yearly prevalence of GLP-1RA use per 100,000 by drug class and age group. The prevalence was defined as the number of individuals filling at least one prescription during the year, divided by the total midyear population. If individuals filled prescriptions for more than one GLP-1RA class within the same year, they were classified according to the class of the last prescription filled in that year.

Fourth, we annually assessed the proportion of prescribers initiating GLP-1RAs, divided into general practitioners, pediatricians, endocrinologists, and others.

Finally, we assessed treatment persistence in the subcohort with treatment initiation before January 1, 2025, to ensure at least 1 year of follow-up. Among incident users, we obtained the number of prescriptions filled during follow-up, categorized into 1, 2, and 3+ prescriptions. A Kaplan–Meier analysis was used to estimate the duration of treatment for each individual, defined as the time from treatment onset to first treatment gap. The "proportion of patients covered" method was used to estimate the proportion of individuals covered by treatment at any given day after treatment initiation disregarding prior treatment breaks [13]. For injection GLP-1RAs, we assumed that each prescription covered 2 months, while for oral GLP-1RAs, we assumed consumption of one tablet per day and added a grace period of 25% to account for noncompliance and irregular refill patterns. Individuals were followed from treatment initiation and censored upon migration, death, or end of follow-up on December 31, 2025. Analyses of treatment persistence were stratified by age group (12–17 and 18–24 years), sex, psychiatric comorbidity, history of diabetes, and whether the GLP-1RAs were approved for diabetes or weight management. All analyses were conducted using Stata version 18.0 (StataCorp LLC).

## 3 | Results

From 2018 to 2025, we identified 12,993 Danish individuals aged 12–24 years initiating therapy with GLP-1RAs. During this period, incidence increased almost exponentially from 8.4 new users per 100,000 in 2018 to 450 per 100,000 in 2024, before decreasing modestly to 418 per 100,000 in 2025. The increase was most pronounced among individuals aged 18–24 years, reaching 749 per 100,000 in 2024 before declining to 686 per 100,000 in 2025. In contrast, increases in use in adolescents aged 12–17 years were more modest but continued throughout the study period from 1.7 in 2018 to 72 per 100,000 in 2025 (Figure 1A). This rise was driven primarily by semaglutide for weight management (Wegovy), with a smaller contribution from Ozempic. Saxenda use peaked in 2021–2022 but declined thereafter (Figure 1B). The prevalence of use followed a similar trend, with increasing use from 2021 onward and reaching 98 per 100,000 in adolescents and 1484 per 100,000 in young adults in 2025. The increase was initially driven by Saxenda and Ozempic and, from 2023, by Wegovy (Figure 2).

### 3.1 | Characteristics of Users

Table 1 summarizes characteristics of new users. The majority were female (64% of adolescents; 75% of young adults), and most (86%–88%) initiated GLP-1RAs approved for weight



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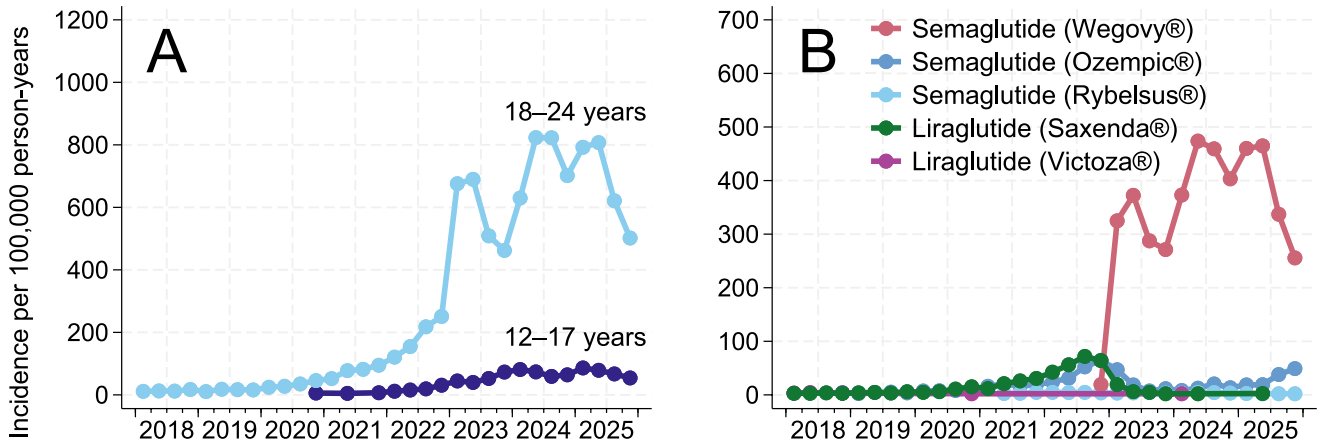


**FIGURE 1** | Quarterly incidence of Danish adolescents and young adults with an incident prescription for a glucagon-like peptide-1 receptor agonist (GLP-1RA) from 2018 to 2025. (A) Incidence rate per 100,000 person-years according to age group. (B) Incidence rate according to specific GLP-1RAs. Tirzepatide was excluded from panel B due to low quarterly numbers of new users, as Danish data privacy regulations preclude reporting incidence rates based on counts fewer than five individuals.

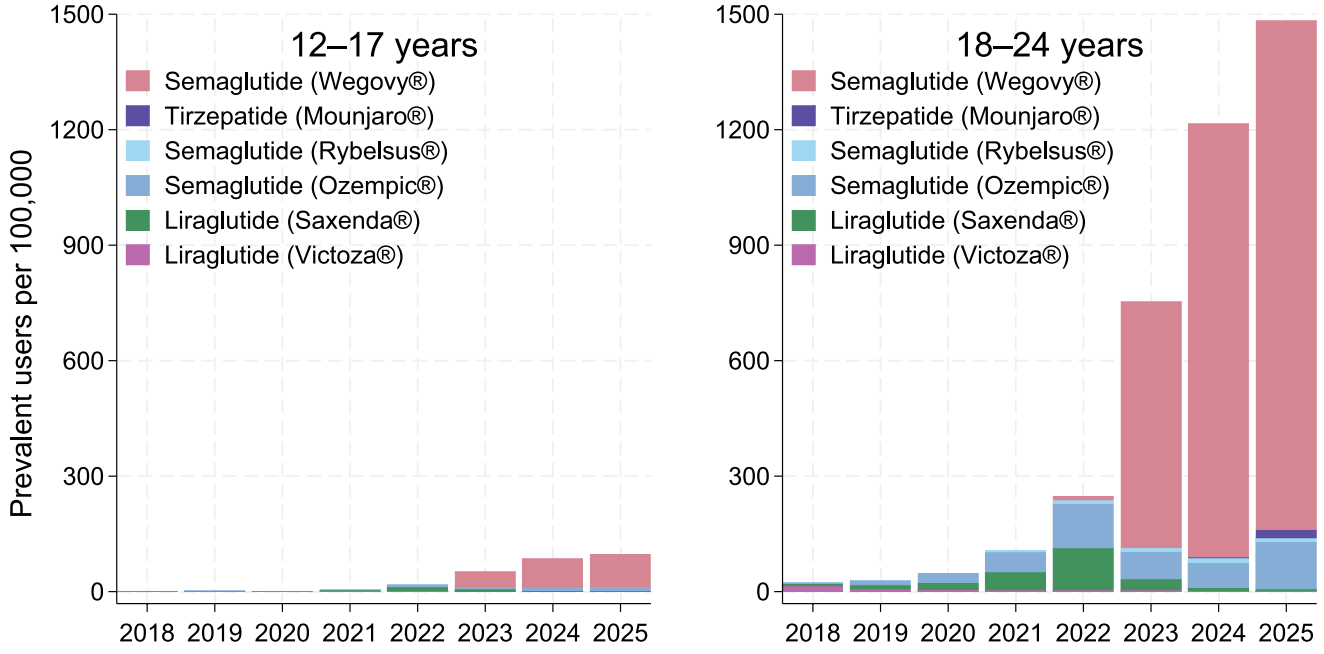


**FIGURE 2** | Yearly number of users per 100,000 of a glucagon-like peptide-1 receptor agonist (GLP-1RA) among Danish adolescents and young adults.

management. Diabetes was recorded in 10% of adolescents and 2.9% of young adults. Alternative indications for use, including polycystic ovarian syndrome, sleep apnea, nonalcoholic fatty liver disease, or rare diseases as Prader Willi syndrome or craniopharyngiomas, were uncommon. Overall, 33% of individuals starting GLP-1RAs had psychiatric comorbidities, most commonly emotional disorders such as depression and anxiety (22%) and neurodevelopmental disorders including attention-deficit/hyperactivity disorder and autism (13%). In the year prior to GLP-1RA initiation, 7% had received antipsychotic treatment, and 14.7% had been prescribed antidepressants. Characteristics stratified by history of diabetes are presented in Table S3. Individuals with diabetes were less often females and were more frequently treated with GLP-1RAs indicated for diabetes, primarily Ozempic. Comorbidities were more common among individuals with diabetes, particularly hypertension and psychiatric comorbidities.

### 3.2 | Prescribers

In total, 78% of GLP-1RA treatments were initiated by general practitioners, accounting for 47% of initiations among adolescents and 80% among young adults. Prescribing patterns shifted substantially over time. Prior to 2021, all GLP-1RA treatments in adolescents were initiated by pediatricians, but by 2022–2025 pediatricians accounted for only 17%–31% of initiations (Figure 3A). Among young adults, the proportion of initiations from general practice increased from 47% in 2018 to 80% in 2025 (Figure 3B).



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**TABLE 1** | Characteristics of Danish adolescents and young adults with a first prescription of glucagon-like peptide-1 receptor agonists (GLP-1RA) during 2018 to 2025.

| | Adolescents aged 12–17 years ($N = 914$) | Young adults aged 18–24 years ($N = 12,079$) |
|---|---|---|
| Patient characteristics | | |
| Median age in years (IQR) | 16 (15–17) | 22 (20–23) |
| Female sex | 588 (64%) | 9019 (75%) |
| Prescription characteristics | | |
| Drug type | | |
| Semaglutide approved for diabetes (Ozempic or Rybelsus) | 94 (10%) | 1369 (11%) |
| Semaglutide approved for weight management (Wegovy) | 705 (77%) | 9698 (80%) |
| Liraglutide approved for diabetes (Victoza) | 30 (3.3%) | 71 (0.59%) |
| Liraglutide approved for weight management (Saxenda) | 85 (9.3%) | 920 (7.6%) |
| Tirzepatide (Mounjaro) | | 8 (0.07%) |
| Other GLP-1RAs | — | 13 (0.11%) |
| Medical speciality of prescribers | | |
| Family medicine/general practice | 429 (47%) | 9647 (80%) |
| Pediatrics | 232 (25%) | 25 (0.21%) |
| Endocrinology | 21 (2.3%) | 235 (1.9%) |
| Other specialty | 20 (2.2%) | 335 (2.8%) |
| Unknown | 212 (23%) | 1837 (15%) |
| Medical history | | |
| Diagnosis of diabetes | 91 (10%) | 356 (2.9%) |
| Rare disorders | 5 (0.55%) | 13 (0.11%) |
| PCOS | 17 (1.9%) | 282 (2.3%) |
| Sleep apnea | 5 (0.55%) | 97 (0.80%) |
| Hypertension | 16 (1.8%) | 254 (2.1%) |
| Nonalcoholic fatty liver disease | ($n < 5$) | 37 (0.31%) |
| Psychiatric comorbidity | 302 (33%) | 4028 (33%) |
| Eating disorders | 9 (0.98%) | 196 (1.6%) |
| Emotional disorders | 170 (19%) | 2739 (23%) |
| Neurodevelopmental disorders | 176 (19%) | 1508 (12%) |
| Psychotic disorders | 31 (3.4%) | 682 (5.6%) |
| Use of psychotropic medication in the year prior to GLP-1RA initiation | | |
| Antipsychotics | 43 (4.7%) | 862 (7.1%) |
| Antidepressants | 93 (10%) | 1820 (15%) |

*Note:* Rare disorders included Prader-Willi syndrome, Laurenve-Moon-Biedl-Bardet Syndrome, and craniopharyngeomas.

### 3.3 | Treatment Persistence

Among new GLP-1RA users, 9% filled only one prescription and 9% filled two, while 82% filled three or more prescriptions during the first year of follow-up. At 1 year, 22% remained in continuous treatment—without a treatment gap, while 38% were covered by a prescription (Figure 4). Treatment persistence was higher in adolescents compared to young adults (54% vs. 37% covered by a prescription after 1 year) and in individuals with diabetes (53% vs. 38%) (Figures S1 and S2). Conversely, treatment persistence was similar across sex, the presence of psychiatric comorbidity, and whether the initiated



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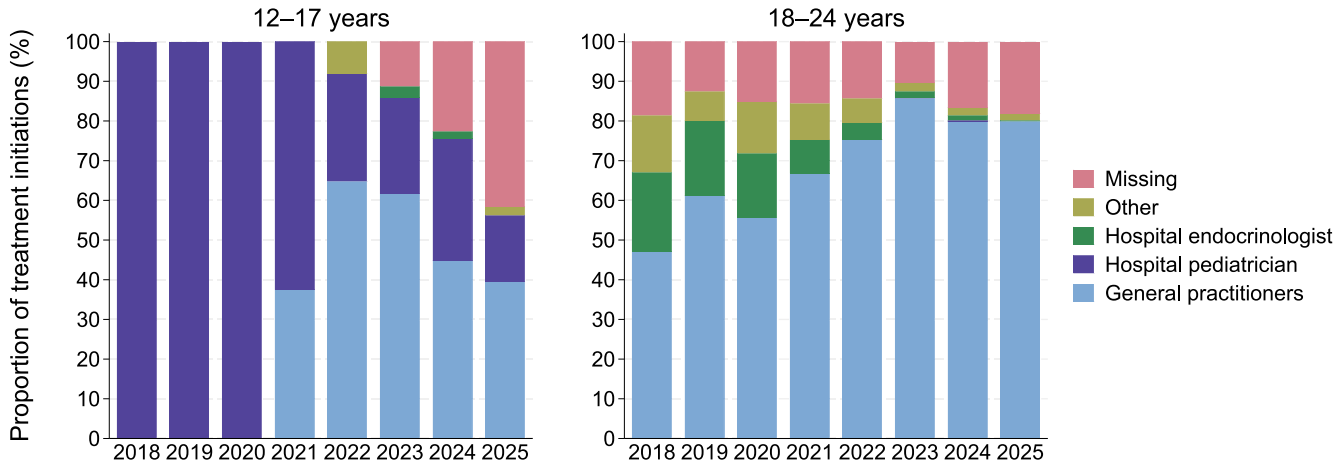


**FIGURE 3** | Distribution of prescribers initiating glucagon-like peptide-1 receptor agonist (GLP-1RA) prescriptions according to age group.

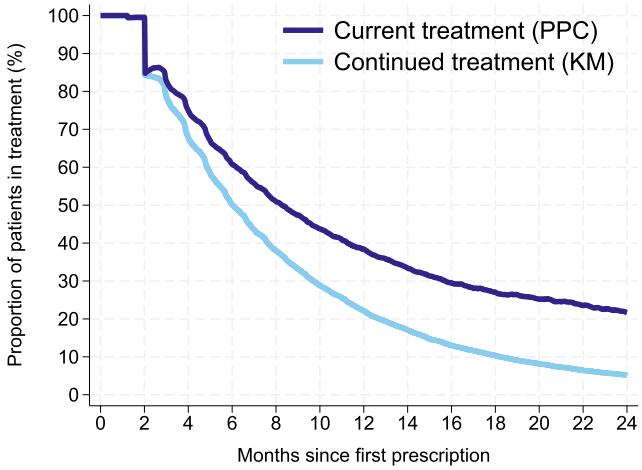


**FIGURE 4** | Treatment persistence to glucagon-like peptide-1 receptor agonist (GLP-1RA) medications. Proportion of incident users who remained in treatment with a GLP-1RA for up to 2 years from their first prescription, measured using the Kaplan–Meier (KM) method and "proportion of patients covered" (PPC) method.

GLP-1RAs were approved for diabetes or for weight management (Figure S3).

## 4 | Discussion

From 2018 to 2025, GLP-1RA use in Danish adolescents and young adults increased more than 50-fold, driven largely by increased prescribing of semaglutide for weight management. The majority of users were female, fewer than 10% had a record of diabetes, and psychiatric comorbidities were frequent, particularly emotional and neurodevelopmental disorders. Most prescriptions were initiated in general practice, with declining involvement of pediatricians and endocrinologists.

Our findings align with recent reports from the United States, where GLP-1RA prescribing in youth has increased sharply, predominantly for obesity treatment [6]. These patterns raise several important clinical considerations. First, data on the long-term safety of GLP-1RAs specifically for adolescents and young adults remain limited. Existing evidence derives largely from studies in older adults with type 2 diabetes or from trials of short duration (typically 1–2 years) [9]. These gaps in evidence are particularly relevant for adolescents, who may receive treatment during periods of growth and pubertal development, and young women of reproductive age, for whom data on safety during pregnancy and lactation are sparse [14]. Second, given the high prevalence of psychiatric comorbidity among GLP-1RA users, there is a need to better understand treatment effectiveness, adherence, and psychiatric safety in this subgroup. While clinical trials have not shown increased rates of depressive symptoms or serious psychiatric adverse events—and have even reported potential improvements in emotional eating behavior and mental quality of life—these studies were small and of short duration, often excluded patients with psychiatric disorders, and primarily involved older adults [15]. Real-world studies are therefore needed to evaluate utilization, effects, and safety of GLP-1RAs in patients with psychiatric comorbidity. Third, our data show that most recent GLP-1RA prescriptions for adolescents were initiated by non-pediatric specialists, despite 2023 national guidelines from the Danish Health Authority stating that pharmacological obesity treatment in 12– to 17-year-olds should be prescribed exclusively by pediatricians and only used as add-on therapy to systematic, family-based treatment programs [16]. The observed divergence from these recommendations raises concerns that treatment may be initiated without adequate consideration of growth, pubertal development, and psychosocial context, indicating the need for clearer clinical guidance and potential regulatory measures to ensure appropriate prescribing in adolescents. Moreover, the steep rise in GLP-1RA use among young adults may also in part reflect a lack of structured, non-pharmacological obesity treatment options in this age group within the Danish healthcare system, leaving pharmacotherapy as one of the few available interventions.

Lastly, we observed a substantial rate of early discontinuation, with only 38% covered by a GLP-1RA prescription after 1 year, consistent with prior US and Danish studies focusing on GLP-1RAs for weight management in adults [17–19]. Discontinuation may be related to side effects but also cost barriers since GLP-1RAs for weight management are not subsidized in Denmark. Emerging evidence suggests early discontinuation is also associated with mental health challenges and socioeconomic disadvantage [9], which is concerning given the higher burden of obesity and treatment needs in these populations [20].



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A key strength of this study is its use of comprehensive national registry data, allowing for population-level estimates and detailed characterization of users without selection bias. However, limitations include the lack of information on exact clinical indication, absence of degree of obesity and detailed information on comorbidities to evaluate appropriateness of prescribing, and limited follow-up time for newer GLP-1RAs.

## 5 | Conclusion

In conclusion, GLP-1RA use has increased substantially in Danish youth from 2018 to 2025, with more pronounced uptake among young adults than adolescents. Use was predominantly for weight management and most often initiated in general practice, and treatment persistence was low. The rapid expansion in use points to the need for stronger clinical guidance and robust evidence on long-term safety and effectiveness specifically for young populations and individuals with psychiatric comorbidity.

### Author Contributions

All authors contributed to the conceptualization of the study. J.H.A. performed the data analysis. H.K. drafted the original manuscript, and all authors provided critical revision of the article. All authors have had full access to study results and have approved the final version for publication.


### Funding

The authors have nothing to report.


### Conflicts of Interest

Helene Kildegaard has participated in sponsor-initiated research projects with Novo Nordisk, with all funds paid to her institution. Anton Pottegård reports participation in regulator-mandated phase IV studies funded by AbbVie, Alcon, Almirall, Astellas, AstraZeneca, Boehringer-Ingelheim, Bristol Myers Squibb, LEO Pharma, Novo Nordisk, Pfizer, and Servier and on sponsor-initiated research projects with Novo Nordisk, all with funds paid to the institution where he is employed (no personal fees). Julie Tonsgaard Kloppenborg has received lecture honoraria, support for congress attendance, and research funding from Novo Nordisk. None of the reported activities is related to the present work. The other authors declare no conflicts of interest.

### Data Availability Statement

Due to Danish data protection regulations, individual-level data cannot be shared directly by the authors. Deidentitied data from Danish healthcare registries is accessible for researchers after application to the Danish Health Data Authority. Aggregate data on drug use in Danish individuals is available from Danish online drug statistics at https://medstat.dk.

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## Supporting Information

Additional supporting information can be found online in the Supporting Information section. **Table S1:** Codes used to define Glucagon-like peptide-1 receptor agonists. **Table S2:** Codes used to define baseline characteristics. **Table S3:** Baseline characteristics, stratified by diabetes history. **Figure S1:** Treatment persistence to GLP-1RAs, stratified by age group. **Figure S2:** Treatment persistence to GLP-1RAs, stratified by diabetes history. **Figure S3:** Treatment persistence to GLP-1RAs, stratified by sex. **Figure S4:** Treatment persistence to GLP-1RAs, stratified by presence of psychiatric comorbidity. **Figure S5:** Treatment persistence to GLP-1RAs, stratified by indication.



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