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## Opioid agonist treatment in transition: A cross-country comparison between Austria, Germany and Switzerland

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### ABSTRACT

**Background and Aims:** OAT is a well developed and successful treatment strategy for opioid dependent patients in Europe. It has significantly contributed to the fight against the HIV and HCV pandemics, leading to an increased life expectancy in this population. Building on the OAT experiences in Austria, Germany, and Switzerland and their models of care, the objective of this study is to analyse experiences and changes in patient structures to identify necessary adaptations for the system of care.

**Methods:** We analysed national register-based data from patients receiving OAT during the period spanning from 2010 to 2020 in Austria, Germany (cases), and Switzerland. We examined and compared OAT policies and practice at national levels through a review of literature and publicly available policy documents.

**Results:** Across these three countries, the life expectancy of OAT patients increased substantially. The mean age increased from 33.0 in 2010 to 39.1 in 2020 in Austria, from 35.6 years to 41.5 years in Germany (cases), and from 39.6 to 47.1 in Switzerland, respectively. In all three countries, the percentage of patients/cases aged 60 years and older increased more than tenfold between 2010 and 2020.

**Conclusions:** Integrated support models, reliable care structures, internationally comparable high treatment coverage, flexible prescribing practices, and a wide range of available OAT medications are successful strategies. The experiences in these countries indicate that it is possible to address the complex and chronic nature of opioid dependence and its concurrent mental and physical health challenges, resulting in an increasing life expectancy of OAT patients.

### 1. Background

Opioid misuse and dependence are serious health conditions, which

is regularly combined with other complex concurrent physical (Pirone et al., 2015) and mental conditions (Santo et al., 2022) that have a significant impact on the overall burden of disease as well as life

**Abbreviations:** DSHS, Deutsche Suchthilfestatistik [Germany's Addiction Care Statistical Service]; HAT, heroin-assisted treatment; HeGeBe, heroin-gestützte Behandlung [heroin-assisted treatment]; NSP, needle and syringe provision; OAT, opioid agonist treatment; OUD, opioid use disorder; PWUD, people who use drugs.

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expectancy (Lewer et al., 2020). The HIV and HCV pandemic (Perlman and Jordan, 2018; Springer et al., 2018), as well as chronic pain syndromes (Volkow and McLellan, 2016) on the one hand, and suicidality and severe trauma (Bohnert and Ilgen, 2019; Na et al., 2022; Vold et al., 2022) on the other, are some examples, which are also interacting with the drug using behavior.

Since 2014, life expectancy of people who are using drugs (PWUD) in the United States and Canada has been decreasing due to the rising prevalence of opioid overdose (Krausz et al., 2022; Krausz et al., 2021; Rehm and Probst, 2018). Despite a recent increase in drug-related deaths, the opioid overdose situation in Europe was quite different. While there were over 100,000 drug overdose deaths reported in the United States in 2021 (28.3 per 100,000 standard population) (Ahmad et al., 2022), there were less than 6000 overdose deaths reported in the European Union in 2021 (17.4 per million of the adult population) (EMCDDA, 2022; Hedegaard et al., 2021).

Overall, the systems of care in European countries are better accessible and provide better quality of care compared to the US and Canada and has a far higher coverage (Krausz et al., 2021). Harm reduction services, safe injection services, and high coverage of opioid agonist treatment (OAT), mostly integrated with low-threshold drug counselling for high-risk opioid users, are standing for an integrated OAT model. This approach, as highlighted by the United Nations (United Nations, 2022), is addressing needs in a more comprehensive way, thereby contributing to a very high retention in care (Busch et al., 2021).

OAT is an evidence-based and proven effective intervention for opioid use disorder (OUD), associated with a multitude of health and social benefits (Degenhardt et al., 2018; Mattick et al., 2014), including

asignificant reduction in HIV incidence (EMCDDA, 2021; Gowing et al., 2004; MacArthur et al., 2012). Since the introduction of OAT in Austria, Germany, and Switzerland, there have been no patient-side requirements to qualify for OAT (see Table 1). The health care systems cover the costs of treatment and patients may freely choose their physician. Following specialized training in addiction medicine, any physician, whether practicing privately or within an institution, is eligible to provide OAT. The dispensing of take-home medications during weekends and holidays is generally permitted, albeit with restrictions (see Table 1). Over the years, changes in legislation, policy strategies, treatment modalities, and structural challenges have emerged. For instance, there have been reports of potential shortages in OAT providers due to the retirement of older physicians and the lack of replacement by younger physicians (Anzenberger et al., 2021; Besson et al., 2014; Stöver, 2010).

Retention in OAT is an important indicator of treatment quality and engagement of individuals with OUD and is associated with a substantial reduction of all cause and overdose mortality (Gisev et al., 2019; Ma et al., 2019; Connor et al., 2020; Sordo et al., 2017). In the past 30 years, these measures contributed to an increased life expectancy of individuals who use opioids. Data from the European Monitoring Centre for Drugs and Drug Addiction suggests that individuals with OUD and aged over 40 may soon become the largest population receiving treatment for substance use disorders in Europe (EMCDDA, 2015; Pirona et al., 2015). This ageing cohort of individuals mainly started consuming opioids during the heroin epidemics of the 1980s and 1990s (Burkinshaw et al., 2017; Morgan, 2014; United Nations, 2018) and shaped the current European drug treatment systems.

**Table 1**  
Setting the scene: Comparison of contextual factors of studied countries.

	Austria	Germany	Switzerland
<b>Healthcare system</b>	Mandatory social insurance system (universal coverage), additional private insurance possible <sup>(1)</sup>	Mixed public-private health care system with an obligation to insure (universal coverage) <sup>(7)</sup>	Private health care system with an obligation to insure (universal coverage) <sup>(13)</sup>
<b>Drugs policy strategies</b>	<ul style="list-style-type: none"> <li>• Austrian addiction prevention strategy (2015–)</li> <li>• ‘Extended addiction cube model’ (based on the Swiss model)</li> <li>• Three broad dimensions: fields of intervention, modality of use and type of psychoactive substance or behaviour</li> <li>• Covers both legal and illegal substances as well as non-substance related addictive behaviour<sup>(2)</sup></li> </ul>	<ul style="list-style-type: none"> <li>• National Strategy on Drug and Addiction Policy (2012–)</li> <li>• Four dimensions: (a) prevention, (b) counselling and treatment, cessation assistance, (c) measures for harm reduction and (d) repression</li> <li>• Legal and illegal substances are considered together<sup>(8)</sup></li> </ul>	<ul style="list-style-type: none"> <li>• National Strategy on Addiction and Action Plan (2017–2024)</li> <li>• Expansion of the four-pillar policy / cube model (prevention, therapy, harm reduction and law enforcement) to include the dimension of three use-patterns (low-risk, problematic, and dependent use)</li> <li>• Covers both legal and illegal substances as well as non-substance related addictive behaviour<sup>(14)</sup></li> </ul>
<b>Health-oriented harm reduction measures</b>	OAT, NSP, low -threshold services, prevention, testing and treatment of drug-related infectious diseases, drug checking, take-home naloxone provision and training <sup>(3)</sup>	OAT, NSP, low -threshold services, prevention, testing and treatment of drug-related infectious diseases, drug checking, take -home naloxone provision and training, supervised drug-consumption rooms <sup>(9)</sup>	OAT, NSP, low-threshold services, prevention, testing and treatment of drug-related infectious diseases, drug checking, take -home naloxone provision and training, supervised drug-consumption rooms <sup>(15)</sup>
<b>Full coverage of OAT through healthcare system</b>	Yes, since 1989 <sup>(4)</sup>	Yes, since 1992 <sup>(10)</sup>	Yes, since 1975 <sup>(16)</sup>
<b>Central OAT registry</b>	Yes	Yes, limited information	Yes
<b>OAT available</b>	Methadone, levomethadone, buprenorphine, buprenorphine + naloxone, SROM <sup>(5)</sup>	Methadone, levomethadone, buprenorphine, codeine, dihydrocodeine, SROM, diacetylmorphine (injectable) <sup>(11)</sup>	Methadone, levomethadone, buprenorphine, oxycodone, SROM, diacetylmorphine (oral and injectable) <sup>(17)</sup>
<b>Top 3 substances used in OAT</b>	SROM (56%), buprenorphine (18%), levomethadone (14%) <sup>(5)</sup>	Levomethadone (37%), methadone (37%), buprenorphine (23%) <sup>(11)</sup>	Methadone (57%), SROM (30%), buprenorphine (8%) <sup>(18)</sup>
<b>Take-home OAT</b>	7 days, up to 30 days for “stabil” patients (in treatment for over 6 months at the same physician) <sup>(6)</sup>	7 days, up to 30 days (in individual cases) <sup>(12)</sup> , take-home diacetylmorphine not permitted	7–14 days, depending on cantonal regulations (Basel: up to 30 days, exception for longer periods possible) <sup>(19)</sup> , diacetylmorphine for up to 7 days <sup>(20)</sup>

Abbreviations: NSP: needle and syringe provision, OAT: opioid agonist treatment, SROM: slow-release oral morphine.

Sources: <sup>(1)</sup> Bachner et al. (2018), <sup>(2)</sup> BMG (2015); Uhl (2013), <sup>(3)</sup> Busch, Anzenberger, et al. (2021), <sup>(4)</sup> ÖGABS, ÖGAM, und ÖGKJP and ÖGPP (2017), <sup>(5)</sup> Anzenberger et al. (2021), <sup>(6)</sup> ÖGABS et al. (2017); SV; BGBl II 1997/374, <sup>(7)</sup> Blümel, Spranger, Achstetter, Maresso, und Busse (2020), <sup>(8)</sup> Drug Commissioner of the Federal Government (2012); Neumeier, Schneider, Karachaliou, Höke, und Friedrich (2021a), <sup>(9)</sup> Neumeier, Schneider, Karachaliou, Höke, und Friedrich (2021b), <sup>(10)</sup> Neumeier et al. (2021a), <sup>(11)</sup> Höke, Friedrich, Schneider, Karachaliou, und Neumeier (2021), <sup>(12)</sup> HLS (2021), <sup>(13)</sup> De Pietro et al. (2015), <sup>(14)</sup> Besson et al. (2014); FOPH (2017); Savary, Hallam, und Bewley-Taylor (2009); Uchtenhagen (2010), <sup>(15)</sup> BAG (2021), <sup>(16, 17)</sup> Pompidou Group (2017); SSAM (2020), <sup>(18)</sup> Labhart und Maffli (2022) <sup>(19)</sup> BAG (2013), <sup>(20)</sup> Meyer, Strasser, et al. (2022).

In the Central European DACH countries, Germany (D), Austria (A), and Switzerland (CH) in particular, a growing number of adults have received OAT for several years and are transitioning into older age. Evidence on these trends is essential for assessing the preparedness of treatment systems and for developing adequate policies and practices of treatment and prevention. The objectives of this study are to analyse trends in life expectancy and age clusters of patients receiving OAT to compare models as well as health care system trends in this area.

## 2. Methods

### 2.1. Analysis of registry-based data

**Data sources:** Primary analyses use aggregated data on treatment demand from the main national datasets.

**Austria:** Each patient entered into the OAT registry ‘eSuchtmittel’ is identified by comparing details with the central population registry, in order to prevent spelling mistakes and double entries. The data is pseudonymised before performing statistical analyses, but relevant demographic information of patients accessing OAT in Austria, such as year of birth, sex, OAT medication, initial dose prescribed, and region are kept. All data are entered into the system by public health officers when OAT started, and these data are updated regularly.

**Germany:** Data on the age and sex distribution of patients in OAT is not available from the national Substitution Treatment Registry maintained by Germany’s Federal Institute for Drugs and Medical Devices (BfArM, Bundesinstitut für Arzneimittel und Medizinprodukte) due to data protection reasons. Instead, we rely on data from Germany’s Addiction Care Statistical Service (Deutsche Suchthilfestatistik, DSHS), which documents cases of individuals with opioid use disorder undergoing psychosocial support for OAT. Cases with opioid use disorder undergoing psychosocial support for OAT are supposed to mirror individuals undergoing psychosocial support for OAT quite well because double counting is usually linked to patients using different service offers within one year (e.g., counselling and psychosocial support of OAT) and not to repeated use of one distinct service (e.g., several episodes of psychosocial support for OAT). Data are reported case-by-case and include all individuals with a primary diagnosis of opioid use disorders and documented OAT in participating outpatient addiction care facilities. Notably, the DSHS covers around 73% of all addiction care outpatient facilities in Germany (Kraus et al., 2019). Since the DSHS records treatment episodes (cases) rather than individual data, there is a possibility of double entries. Assuming individuals rather than episodes and using the number of recorded patients receiving OAT from the national Substitution Treatment Registry, the proportion of the number of patients who underwent OAT in addiction care in the period between 2010 and 2020 ranged from 7.1% to 13.1%, with the lowest proportion observed in 2010 at 3.7%. We also consider a constant rate of individuals with more than one episode per year, which allows us to conclude that while the DSHS data may overestimate the number of patients, they provide an unbiased view of temporal changes in the age and gender distribution of OAT patients.

**Switzerland:** Since 2004, Switzerland has used the ‘act-info’ network (acronym for addiction, care and therapy information) for the monitoring of individuals receiving outpatient and inpatient treatment for substance use disorders, including OAT (Maffii et al., 2020). It functions as the national statistical documentation system and is funded by the Federal Office of Public Health. OAT data collection and monitoring is anchored in the Narcotics Act and is carried out by the cantonal services, which are then used to create a centralized national database which allows for standardized and comparable results (Labhart and Maffii, 2021). The OAT statistic includes all available OAT medication, except for diacetylmorphine. Though also integrated into the *act-info network*, heroin-assisted treatment (HAT) is monitored separately (*HeGeBe statistic*) since 2001 (Gmel et al., 2021). In the early years of the statistic, anonymity of patients was respected. Therefore, age was often unknown

and the sample size in [Supplementary Table 1](#) does not correspond to the actual number of patients in treatment in the corresponding year. Collection of patient age improved over time when an online data entry system was installed in 2013.

**Data analysis:** Age- and sex-specific data were used to analyse the age structure of patients receiving OAT in the years from 2010 to 2020. For each year, we accessed aggregated data from all individuals receiving OAT within the respective year. To examine age trends, we arbitrarily use the following age groups: 15–29, 30–39, 40–49, 50–59 and  $\geq 60$ .

### 2.2. Legislation and policy selection

**Information sources:** Information on national Austrian, German, and Swiss drug treatment policies and regulations was collected between January 2022 and June 2023. Data on policies were primarily obtained from publicly available online governmental sources and subsidiaries. Additional insights and validation were provided by national experts involved in drug-related research in these three countries. All experts are directly involved in projects related to the social, legal, and health aspects of OAT in their respective countries, and were thus able to access and collect relevant information and reports.

**Analysis approach:** The two-part analysis examined: 1) historic background and legal developments of OAT, and 2) organisational structure of OAT and responses at national levels. The differences and commonalities between the content and structure of the policies and jurisdictions were compiled at national levels. In addition, the implementation of drug and addiction policies, the availability of harm reduction measures, contextual factors, and national policies were also assessed.

## 3. Results

In the first part, we explore the historic background and legal developments of OAT in Austria, Germany, and Switzerland, followed by an examination of the organizational structure of OAT and corresponding responses at national levels.

### 3.1. Legislation and policy review

#### 3.1.1. Austria

**3.1.1.1. Historic background and legal developments of OAT.** In Austria, health care is based on a mandatory social insurance system for almost all employed, self-employed and even unemployed individuals (covered by social assistance system). All insured have a legal right to use almost all medical services equally, even though the insurance fees are proportional to the income of the insured.

The *Narcotic Substances Act* (*Narcotic Drugs Act* until 1997; SGG; BGBl I 1951/234), constitutes the Austria’s drug policy framework (SMG; BGBl I 1997/112), covering narcotic drugs, psychotropic substances, and precursors. The *Narcotic Drugs Regulation* (SV; BGBl II 1997/374) and the *Regulation on Further Training in Oral Substitution* (BGBl II 2006/449) have governed OAT since 2006. The latter regulation defines the extent and organisation of a mandatory special training for physicians who want to deliver OAT. A later amendment to the *Narcotic Drugs Regulation*, enacted in January 2018 (BGBl II 2017/292), added further guidance developed by a large number of experts (ÖGABS et al., 2017). The original *Narcotic Substances Act* from 1951 (SGG; BGBl I 1951/234) allowed narcotic prescription for medical or scientific purposes but excluded OAT, leading to physicians facing criminal punishment. In 1981, a perception shift occurred, defining OAT for the first time to be in line with the principles of medical science with some restrictive conditions on patients’ side. Since 1989, OAT is a recognised form of treatment covered by the social insurance system.

Amendments of the *Narcotic Substances Act* and/or related



regulations over time refined patient and practitioner requirements. The latest (BGBl II 2020/215), enacted in May 2020, abolished the restriction of OAT to oral application but still excludes HAT, marking a significant difference in OAT provision among the three countries.

**3.1.1.2. Organisational structure of OAT and national responses.** The Austrian OAT registry, established in 1989 alongside the official recognition of OAT, is maintained by the Federal Ministry of Health. Since OAT gained recognition, local health authorities are obliged to validate all OAT prescriptions to the OAT registry. In spring 2011, a new online-based registry ‘eSuchtmittel’ was introduced, ensuring nearly perfect data quality through extensive quality assurance measures (Busch et al., 2021; GÖG/ÖBIG, 2011, 2013).

While the national Austrian Addiction Prevention Strategy (BMG, 2015) and state-level addiction or drug strategies form the basis for supporting and treating persons with an OUD, the organisational mode and availability of OAT vary based on regional priorities (e.g., centralised vs. decentralised supply structures). Although specialised outpatient services and hospital outpatient departments offer OAT, the majority of patients receive OAT through general practitioners or psychiatrists (Anzenberger et al., 2021). In 2020, each physician, on average, treated 31 OAT patients, but the number of physicians providing OAT is declining. Retirement and the reluctance of many physicians to offer OAT have resulted in severe underserved regions (Anzenberger et al., 2021). Some federal states started targeted efforts, such as annual training seminars, to encourage physicians to provide OAT (SDW, 2022).

Take-home medication, usually limited to seven days due to inflexible regulations, can be extended to 30 days for “stable” patients who have received OAT from the same physician for at least six consecutive months (SV; BGBl II 1997/374). Guidelines (ÖGABS et al., 2017) suggest considering factors like incidents related to diverting OAT medication, the therapeutic relationship’s quality, and the degree of social integration when prescribing take-home doses. With the onset of the COVID-19 pandemic, swift legal and administrative changes occurred. Under the second COVID-19 Act (BGBl I 2020/16), a new section of the SMG allowed physicians to issue long-term prescriptions for OAT medication for an extended period (BGBl I 2022/91). Additionally, physicians gained the ability to send OAT prescriptions directly to pharmacies via email.

### 3.1.2. Germany

**3.1.2.1. Historic background and legal developments of OAT.** Germany’s mandatory health insurance also provides universal coverage but follows a distinct structure compared to Austria and Switzerland. The German healthcare system is organised as a parallel system, with privatised insurance covering both inpatient and outpatient care alongside a statutory insurance system organized around federated insurances. Individuals can choose private insurance by opting out of the public system based on income exceeding a defined threshold. Financing for statutory health insurance primarily relies on income-related contributions, pooled centrally and then reallocated to sickness funds based on the constituents’ health needs. Private health insurance is funded through premiums determined by individual health risk at entry (“lifetime underwriting”) (Blümel et al., 2020).

Since the introduction of the first Narcotics Act in Germany in the 1920 s, the main focus has been on developing measures to regulate narcotic diversion rather than on prevention, care, treatment, and rehabilitation. The legal basis for establishing OAT in Germany as a recognised form of treatment covered by the health insurance funds was established in 1992 through its incorporation into the Narcotic Drugs Act (BtMG) (Lehmann et al., 2021). In 2009, HAT which previously held a “project”-status, became a regular treatment option and was legally integrated into regular care through amendments to the Narcotic Drugs

Act (BtMG), the Medical Products Act (AMG) and the Regulation on the Prescription of Narcotic Drugs (BtMVV).

The reform of the Narcotic Drugs Prescription Regulation (BtMVV) in May 2017 is particularly relevant for the legal framework of OAT. A central innovation in this reform is the improvement of legal certainty for OAT-prescribing physicians, ensuring treatment continuity and quality in the future through a adequate number of physicians. In the early 1990 s, no official guidelines for OAT existed. Treatment contents and goals were specified by the BtMVV as well as the Guidelines on New Examination and Treatment Methods (NUB guidelines). The Federal Medical Association introduced the first OAT guideline in 2002, revised in 2009/2010 and last amended in 2017. In the course of the reform, all regulations governing medical-therapeutic treatment were transferred to the Federal Medical Association, now the authoritative body defining the state of the art. The goal of abstinence is no longer stipulated, additional substance use is no longer a compelling reason to exclude patients from treatment, and while psychosocial support is recommended, it is not mandatory (HLS, 2021).

**3.1.2.2. Organisational structure of OAT and national responses.** The OAT registry for the federal states is maintained by the Federal Institute for Drugs and Medical Devices (Bundesinstitut für Arzneimittel und Medizinprodukte; BfArM) and aims to prevent multiple prescriptions of OAT medications for the same patient by different physicians (Bundeso-piumstelle, 2022).

In 2021, an average of 33 OAT patients were treated per physician, primarily on an outpatient basis by practice-based physicians or in specialised outpatient clinics (Höke et al., 2021). HAT with diamorphine in Germany is underlying very strict admission criteria for patients and specific organisational requirements for medical institution (Roy et al., 2016). In 2021, only 13 facilities in seven federal states (out of 16) provided HAT with diamorphine, constituting 1.5% of all patients receiving OAT (Bundesopiumstelle, 2022).

In the course of the reform of the Narcotic Drugs Prescription Regulation (BtMVV) in 2017, the option for of a take-home prescription was extended from seven to up to 30 days (HLS, 2021). Additionally, the consultant physician model, permitting non-specialist physicians to prescribe OAT under qualified supervision, was expanded from three to ten patients. Since 2017, specialists in approved residential care facilities, hospices, medical rehabilitation facilities, or other suitable facilities may also dispense OAT (HLS, 2021). In 2023, the group of persons who may provide patients with the OAT for immediate intake in specified facilities was further broadened to include other suitable (non-medical) personnel who have been instructed by the OAT prescribing physician (BtMVV, 2023).

### 3.1.3. Switzerland

**3.1.3.1. Historic background and legal developments of OAT.** Switzerland has a highly decentralised universal health care system, primarily governed at cantonal level. The Swiss Federal Health Insurance Act of 1994, implemented in 1996, ensures comprehensive medical treatment for all residents, covering most physician visits, hospital care, pharmaceuticals, devices, home care, medical services in long-term care, physiotherapy, and OAT.

The historic federal law on narcotics, first documented in September 1994 and ratified in November 2008 (Savary et al., 2009), established the ‘Four Pillars’ principle, namely prevention, therapy, harm reduction, and law enforcement (Besson et al., 2014; Savary et al., 2009; Uchtenhagen, 2010). Since 1975, Switzerland has had a legal framework for OAT, initially only with methadone. OAT prescription requires authorization by the cantonal physician, with requests or treatment announcements being a legal obligation (Federal Act on Narcotics and Psychotropic Substances 1951; Labhart and Maffli, 2021). Cantons typically grant one to two-year authorizations, ensuring reliable patient

demographic data and treatment modalities, although some cantons offer longer terms (10 years or more) (Labhart and Maffli, 2021). Diacetylmorphine prescription, although similar, is federally regulated rather than at cantonal level (Gmel et al., 2021; Labhart and Maffli, 2021).

**3.1.3.2. Organisational structure of OAT and national responses.** The act-info network serves as the national statistical documentation system, striving to include all individuals undergoing outpatient and inpatient treatment for substance use disorders, with complete coverage of OAT in Switzerland (Labhart and Maffli, 2022; Maffli et al., 2020). In Switzerland, access to OAT and coverage of HAT is high. OAT is primarily administered by general practitioners and specialised facilities, but also at psychiatric services, hospitals, and prisons (Labhart and Maffli, 2022). For HAT, patients must meet various criteria, including two unsuccessful traditional treatment attempts, social/mental/physical harm, opioid use disorder for at least two years, and being 18 or older. In 2020, 22 institutions in 13 cantons (out of 26) had authorization to prescribe diacetylmorphine (Gmel et al., 2021).

Take-home policies vary across cantons, for instance, two weeks in Zurich and four weeks in Basel, with potential for longer periods, contingent on patients' medical and social stability. For HAT, the Swiss Federal Council has amended the regulation in 2022, enhancing flexibility to better address specific patient needs (Meyer et al., 2022). Initially permitting up to two days of diacetylmorphine, this regulation was extended to allow take-home medications for up to seven days in the

context of the COVID-19 pandemic (BAG, 2022). However, take-home HAT requirements remain rather strict, including social and medical stability, two negative urinalyses for substances beyond opioids, and at least six months in treatment, among others. (Meyer et al., 2022).

Current clinical guidelines from the Swiss Society of Addiction Medicine (SSAM) and the Federal Office of Public Health emphasise swift and widespread access to OAT, with coordinated efforts from all partners involved in the biopsychosocial support system (Besson et al., 2014; Pampidou Group, 2017; SSAM, 2020). In the SSAM's summary of medical recommendations for OAT, dating back to 2013 (BAG, 2013), it is stated that "the available medical and social resources should be used to ensure that people who use opioids who are increasingly in need of care can be supported in their familiar surroundings for as long as possible" and that "nursing homes or assisted living facilities constitute an alternative where OAT can be continued through a coordinated care network." (BAG, 2013). However, concrete plans or implementation strategies are currently lacking.

**3.2. Data analysis**

Data on patients receiving OAT over an eleven-year period in Austria, Germany, and Switzerland reveal a distinct trend towards an aging OAT population in the three countries. Life expectancy is highest in Switzerland, followed by Austria, and Germany. As shown in Table 2 and Fig. 1, the number of Austrian patients aged 60 years and older increased tenfold, from 3 per 100,000 population in 2010 to 30 per

**Table 2**  
Trends in age structure of patients receiving OAT from 2010 to 2020 in Austria, Germany (cases) and Switzerland.

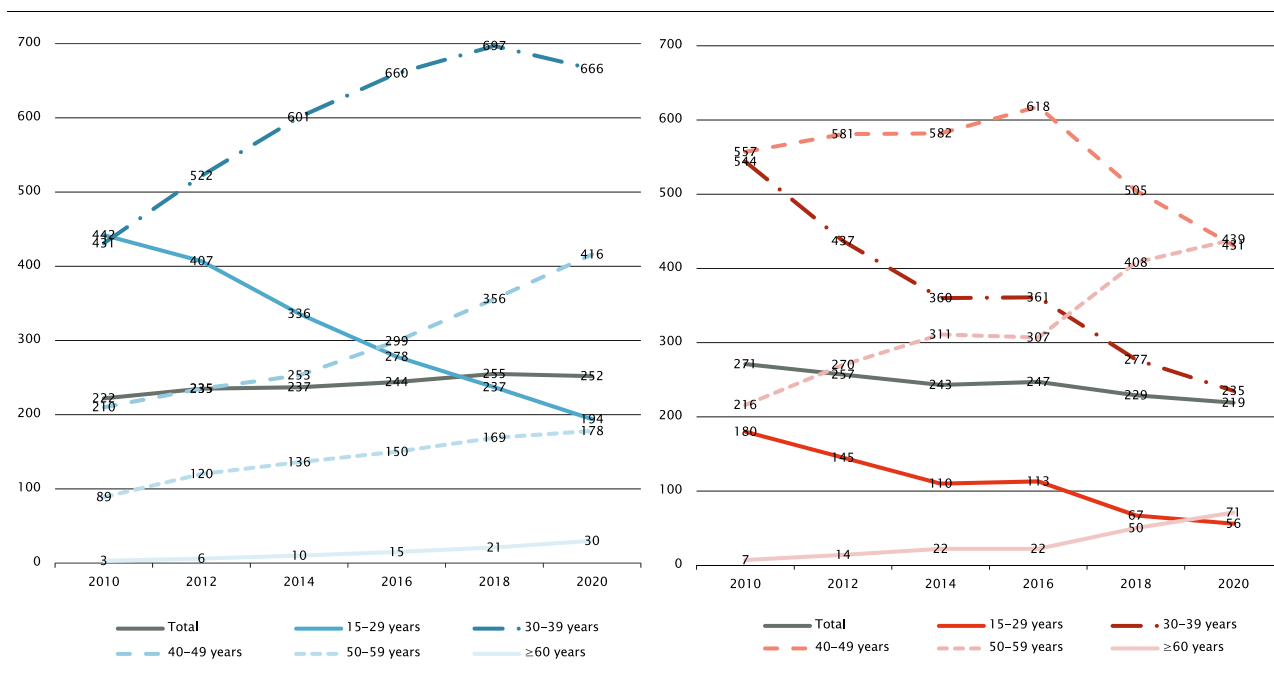
Austria	Age	2010		2012		2014		2016		2018		2020		relative change
		(n = 15,798)		(n = 16,892)		(n = 17,272)		(n = 18,222)		(n = 19,216)		(n = 19,233)		
		per 100,000	(%)	per 100,000	(%)	per 100,000	(%)	per 100,000	(%)	per 100,000	(%)	per 100,000	(%)	(2010–2020)
<b>Age groups</b>	<b>Total</b>	222		235		237		244		255		252		13.6%
	15–29	442	44.1%	407	37.8%	336	30.6%	278	24.5%	237	19.7%	194	15.7%	-56.1%
	30–39	431	30.7%	522	34.1%	601	38.8%	660	41.7%	697	43.0%	666	42.2%	54.6%
	40–49	210	18.6%	235	19.2%	253	19.7%	299	21.3%	356	22.9%	416	25.7%	97.8%
	50–59	89	6.1%	120	8.2%	136	9.7%	150	10.7%	169	12.0%	178	12.9%	100.0%
	≥60	3	0.4%	6	0.7%	10	1.2%	15	1.7%	21	2.4%	30	3.5%	786.5%
	Mean	33.0		34.4		35.6		36.8		37.9		39.1		18.3%
	Median	31.0		32.0		34.0		35.0		36.0		38.0		22.6%
<b>Germany</b>	<b>Age</b>	<b>2010</b>		<b>2012</b>		<b>2014</b>		<b>2016</b>		<b>2018</b>		<b>2020</b>		<b>relative change</b>
		(n = 2932)		(n = 9983)		(n = 8875)		(n = 9266)		(n = 6687)		(n = 5810)		(2010–2020)
		(%)		(%)		(%)		(%)		(%)		(%)		(%)
<b>Age group</b>	15–29	28.1%		21.2%		16.3%		13.1%		11.5%		10.2%		-27.9%
	30–39	39.7%		41.3%		43.0%		41.4%		39.4%		33.5%		67.1%
	40–49	25.0%		29.2%		30.0%		30.8%		32.2%		35.0%		177.8%
	50–59	6.8%		7.7%		9.7%		12.8%		14.6%		17.7%		417.6%
	≥60	0.3%		0.6%		1.0%		1.8%		2.2%		3.5%		1920.0%
	Mean	35.6		36.9		38.1		39.4		40.2		41.5		16.7%
<b>Switzerland</b>	<b>Age</b>	<b>2010</b>		<b>2012</b>		<b>2014</b>		<b>2016</b>		<b>2018</b>		<b>2020</b>		<b>relative change</b>
		(n = 18,126)		(n = 17,563)		(n = 17,071)		(n = 17,723)		(n = 16,708)		(n = 16,144)		(2010–2020)
		per 100,000	(%)	per 100,000	(%)	per 100,000	(%)	per 100,000	(%)	per 100,000	(%)	per 100,000	(%)	(%)
<b>Age groups</b>	<b>Total</b>	271		257		243		247		229		219		-19.2%
	15–29	180	14.4%	145	11.9%	110	9.3%	113	7.5%	67	5.9%	56	5.0%	-69.1%
	30–39	544	32.9%	437	27.3%	360	23.8%	361	22.3%	277	20.0%	235	18.1%	-56.9%
	40–49	557	39.5%	581	42.2%	582	42.6%	618	40.2%	505	36.3%	431	32.1%	-22.7%
	50–59	216	12.5%	270	17.1%	311	21.6%	307	26.0%	408	31.5%	439	35.3%	103.6%
	≥60	7	0.6%	14	1.5%	22	2.6%	22	4.0%	50	6.4%	71	9.5%	978.2%
	Mean	39.6		41.4		42.8		44.2		45.8		47.1		18.8%
	Median	40.0		42.0		43.0		45.0		47.0		48.0		20.0%

Sources:

Austria: Statistik Austria (2022) eSuchtmittel. Note: Population rates are based on official statistics of the population in the corresponding years. Relative change was based on rates per 100,000 population.

Germany: Source: Germany's Addiction Care Statistical Service (Deutsche Suchthilfestatistik, DSHS). Note: The DSHS covers around 73% of all addiction care outpatient facilities in Germany (Kraus et al., 2019). Relative change was based on the percentages in age groups and not on rates per 100,000.

Switzerland: Source: Bundesamt für Statistik (2022), BAG/act-info (own calculation). Note: Before computing the rates per 100,000 population, the numbers of OAT patients per year, age group and gender were weighted to compensate for missing information on age or gender in a few cases. Trends in age structure of people receiving HAT with prescription diacetylmorphine can be found in the supplementary material.



**Fig. 1.** Trends in age structure of patients receiving OAT from 2010 to 2020 in Austria (left) and Switzerland (right) per 100,000 population. Sources: Austria: Statistik Austria (2022) eSuchtmittel. Note: Population rates are based on official statistics of the population in the corresponding years. Relative change was based on rates per 100,000 population. Switzerland: Source: Bundesamt für Statistik (2022), BAG/act-info (own calculation). Note: Before computing the rates per 100,000 population, the numbers of OAT patients per year, age group and gender were weighted to compensate for missing information on age or gender in a few cases. Trends in age structure of people receiving HAT with prescription diacetylmorphine can be found in the supplementary material.

100,000 population in 2020 (relative numbers: 6.1% in 2010 to 12.9% in 2020). Concurrently, there was a decline in the number of patients under the age of 30, from 442 per 100,000 population in 2010 to 194 per 100,000 population in 2020. The average age of patients increased from 33.0 years in 2010 to 39.1 years in 2020. The proportion of female patients remained relatively stable, with 27.0% in 2010 and 25.4% in 2020 (see supplementary material). In Germany, comprehensive data on the age and sex distribution of OAT patients are not available from the national Substitution Treatment Registry due to data protection reasons. As a proxy, case-by-case data from Germany's Addiction Care Statistical Service (DSHS) on individuals with a primary diagnosis of opioid use disorders and documented OAT in participating outpatient addiction care facilities were analysed, revealing a similar trend towards an aging population. The percentage of cases aged 60 and older increased more than tenfold, from 0.3% in 2010 to 3.5% in 2020 (see Table 2), while the proportion of cases under 30 decreased from 28.1% in 2010 to 10.2% in 2020 (see supplementary material).

Swiss data (excluding prescription diacetylmorphine) show a more pronounced trend compared to Austria and Germany (see Table 2). The number of OAT patients aged 60 years and older increased more than tenfold, from 7 per 100,000 population in 2010 to 71 per 100,000 population in 2020 (relative numbers: 0.6% in 2010 to 9.5% in 2020). The average age of OAT patients in Switzerland increased from 39.6 years in 2010 to 47.1 years in 2020. No significant sex-specific differences were observed (see supplementary material). A similar development is seen in patients who receive HAT with diacetylmorphine (see Table 1 in supplementary material). Between 2010 and 2020, there was a steady increase in the number of HAT patients, particularly in the age groups of 50–59 years and 60 years and older. The relative number of patients aged 60 or older increased from 0.2% in 2010 to 5.5% in 2020. The median and mean ages of both male and female HAT patients increased by approximately six to seven years during this period.

#### 4. Discussion

Data on OAT patients show a steady increase in the mean, median age and number of OAT patients aged 60 or more per 100,000 population in Austria, Germany (cases), and Switzerland between 2010 and 2020. This aging trend is most pronounced in Switzerland, followed by Austria and Germany. Our data analysis substantiates the policy's assertions, presenting empirical evidence of the shifting demographic landscape among patients receiving OAT in Austria, Germany, and Switzerland. Moreover, it echoes the policy's historical emphasis on adapting prescribing practices and offering a diverse range of OAT medications. These alignments suggest a healthcare landscape capable of effectively addressing the needs of older individuals with opioid dependence. The consistency in both the median age and the proportion of individuals across age groups supports the argument that changes in the demographic landscape among OAT patients are not a result of cohort effects. Instead, our findings suggest that other factors are influencing the age distribution within the existing OAT patient population over time. Another trend is the decline of PWUD in younger age groups, which may be an indicator for a change in the attractiveness of opioid use in these countries as described by Nordt and Stohler (2006). The harm-reduction policy of Switzerland and its emphasis on the medicalization of the heroin problem, rather than seeing it as a rebellious act, appears to have contributed to the image of heroin as "unattractive" for young people. With increasing life expectancy in the general population and among PWUD, and the ageing of baby boomers (Specht et al., 2021), an increase in the average age of OAT patients is expected. However, the sharp increase observed in OAT patients in these countries can presumably largely be attributed to measures reducing PWUD's mortality. The availability of OAT in combination with less restrictive prescribing practices and more effective medications (Bech et al., 2019; Pearce et al., 2020) is most likely an important factor. Other factors include more and better clinical services and an increased focus on treating comorbidities in an integrated model of OAT with good access to

the overall system of care. Our findings are consistent with reports from the UK (Matheson et al., 2017) and Ireland (Carew and Comiskey, 2018) showing that patients in treatment are getting older.

Despite this trend, the ageing of this population still raises a number of questions. Currently, their treatment, especially OAT, is structured around their mobility and independent visits to physicians, pharmacy pick-up and/or specialized clinics. With more limited mobility, other settings and more take-home would be an appropriate move. The positive results of the expansion of the take-home OAT during the COVID-19 pandemic in several countries showed that this approach can be readily integrated into routine clinic care (Amram et al., 2022; Dunn et al., 2021; Strizek et al., 2023). Moreover, it may improve patient satisfaction, particularly in older ones, and the quality and effectiveness of OAT (Frank et al., 2021). A recent study analysed changes in the framework conditions of OAT in Austria and their associated effects on treatment practice, quality, and processes through an online survey among public health officers, physicians, pharmacists, and other professionals involved. The authors found that measures introduced to ensure physical distancing for OAT clients during the COVID-19 pandemic were positively assessed by the majority of professional groups, both in terms of improving patient-friendliness and facilitating administrative procedures. These measures can be utilized to further enhance the modernization of the Austrian OAT structures and to increase treatment attractiveness (Strizek et al., 2023). The existing rules and prejudices surrounding take-home OAT should be evaluated against the potential of allowing healthy older patients in stable treatment to attend fewer visits of the treatment provider by extending the number of take-home doses. At the same time, it is important that OAT providers ensure an optimal level of support. This may be achieved by working proactively through outreach work and low threshold services or by involving external help systems (e.g., family, relatives, home care services), which can additionally offer assistance with medication management and everyday activities (Dürsteler-MacFarland et al., 2011).

An adaptation of the pharmacotherapies should be provided based on patient's wishes and needs. Long-acting buprenorphine depot or implant formulations (Soyka and Franke, 2021) could play a role in that. Dufort and Samaan (2021) recommend buprenorphine as a first line agent over methadone in the older adult population, due to a more favourable safety profile and relative accessibility. On the other hand, SROM which is Austria's most commonly prescribed OAT medication, should not be used in older adults with renal impairment, according to recent Canadian guidelines (Rieb et al., 2020). Since available data suggests that older adults respond well to OAT, age should not be a barrier to appropriate treatment (Dufort and Samaan, 2021; Köck et al., 2021). As shown by Swiss data and described in Johnston et al. (2017), heroin-assisted treatment can be safely used in older adults as part of a diversified treatment approach. A recent Swiss case series showed that nasal HAT can be a feasible therapeutic option for older patients who developed injecting-related injuries and diseases, suffer from pulmonary diseases, or present deteriorated peripheral access veins (Meyer et al., 2022; Vogel et al., 2022). However, the historically strong emphasis on long-term or even life-long treatment retention in the Austrian, German and Swiss healthcare systems contrasts with the prevalent desire among many patients to gradually reduce or entirely cease treatment (Nehlin et al., 2022; Weinstein et al., 2018; Winstock et al., 2011). Opioid tapering poses challenges for patients and physicians, with limited evidence guiding the process, particularly in primary care settings, where most OAT is prescribed in the three countries. The feasibility of discontinuing OAT for stable long-term patients without causing relapse is an understudied aspect (Amato et al., 2011; Frank et al., 2017). Qualitative research could further explore patient and provider attitudes, enhancing communication and fostering a collaborative approach.

Regardless, it is important to secure that relevant structural support is in place to continue OAT within long-term care or skilled nursing and social work services, including community drug treatment services (Lewer et al., 2022). It is evident that healthcare professionals need to be

equipped and prepared to adequately deal with practical challenges associated with treating older OAT patients. These might comprise chronic and age-related diseases, pain and hyperalgesia, tolerance to opioids and disability, and neurocognitive impairments (Vogt, 2009). Nursing homes must establish the necessary infrastructure, including emergency equipment (naloxone, oxygen masks) and secure storage for OAT medications, to be adequately prepared for this patient group. Improved infrastructure for elderly patients, provision of OAT in nursing homes, clear concepts of treating elderly OAT patients and further education in palliative care were demanded also by staff members of different treatment centres in Switzerland (Köck et al., 2021).

Pain management and palliative care will increasingly present important clinical challenges in elderly patients who are dependent opioids (Mayfield et al., 2021). The role of collaborative structures and interdisciplinary partnerships in ensuring that people are safe, have a good quality of life, and are engaged with relevant services needs to be recognised and supported. These may include addiction services, primary and secondary care providers, peers and other external help systems such as home care services and family members. By involving consultant addiction medicine physicians affiliated to addiction services, OAT could be safely provided in care facilities. Patient transport services could also link immobile patients with OAT providers and services.

Older people who use drugs are not the focus in the current systems (Council of the European Union, 2020; UNODC, 2020). To respond to the challenges for the entire health and social care system in the near term, future decision-making and treatment planning will need to adapt to higher care demands due to multimorbidity and the limited mobility of this population. Systematic monitoring on a regional and national level to identify structural gaps and inform health care system development and systematic clinical research in this age group need to be established. Overlooking this development would pose additional challenges for emergency services and the general system.

#### 4.1. Strengths and limitations

This article contributes to the evidence by providing national representative data on age trends in OAT receiving populations as well as a comprehensive overview on the historic background and legal developments of OAT, the organisational structure of OAT and relevant national responses in three Central European countries. However, data collection and access to existing information is limited. Despite the existence of a central OAT registry in Germany, it was not possible to collect representative information on the age structure of these OAT patients. As a proxy, we provide data from OAT cases in participating outpatient addiction care facilities in Germany.

## 5. Conclusions

Accessible programs, comprehensive coverage, needs adapted prescribing practices, and a wide choice of available OAT medications in Austria, Germany, and Switzerland indicate an effective approach of managing the complex and chronic nature of opioid dependence. While the rising average age bolsters the case for providing OAT to older populations in general, it can also stand as a tangible benchmark for assessing the effectiveness of treatment systems in accommodating older individuals.

Comprehensive regional and national monitoring, along with coordinated care across providers, facilitates the development of innovative outpatient-level nursing services and supports systematic clinical and needs-based research in the future.

#### Ethics approval

The authors declare that they have obtained ethics approval from an appropriately constituted ethics committee/institutional review board



where the research entailed animal or human participation. The study was approved by the Medical University of Vienna Ethics Committee (reference no: 1377/2022).

### CRedit authorship contribution statement

**Tanja Schwarz:** Conceptualization, Methodology, Data curation, Writing – original draft, Project administration. **Judith Anzenberger:** Resources, Data curation. **Martin Busch:** Writing – review & editing. **Gerhard Gmel:** Resources, Data curation, Writing – review & editing. **Ludwig Kraus:** Resources, Data curation, Writing – review & editing. **R. Michael Krausz:** Writing – review & editing. **Florian Labhart:** Resources, Data curation, Writing – review & editing. **Maximilian Meyer:** Writing – review & editing. **Michael P. Schaub:** Writing – review & editing. **Jean N. Westenberg:** Conceptualization, Writing – original draft. **Alfred Uhl:** Writing – review & editing, Supervision.

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### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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### Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.drugalcdep.2023.111036](https://doi.org/10.1016/j.drugalcdep.2023.111036).

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