



Original article

Trends in hospital admission related to poisoning by, narcotics and psychodysleptics and poisoning by antiepileptic, sedative-hypnotic, and antiparkinsonism drugs in England and Wales between April 1999 and April 2020: An ecological study

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ABSTRACT

Background: This study aimed to investigate the trend of hospital admissions related to poisoning by narcotics and psychodysleptics and poisoning by antiepileptic, sedative-hypnotic, and antiparkinsonism drugs in England and Wales between April 1999 and April 2020.

Methods: An observational ecological study were conducted using data from the Hospital Episode Statistics database in England and the Patient Episode Database for Wales. The rate of hospital admissions with 95% confidence intervals (CIs) was calculated by dividing the number of episodes of poisoning by narcotics and psychodysleptics related admission and poisoning by antiepileptic, sedative-hypnotic, and antiparkinsonism drugs-related admission by the mid-year population from the Office for National Statistics. All analyses were conducted using SPSS version 27.

Results: The total annual number of hospital admissions for narcotics and psychodysfunctionals poisonings increased by 1.40-fold [from 15.70 (95% CI 15.36–16.04) in 1999 to 37.64 (95% CI 37.15–38.13) in 2020 per 100,000 people, $p < 0.01$]. However, the overall annual number of poisonings by antiepileptic, sedative-hypnotic and antiparkinsonism drugs hospital admissions for various reasons decreased by 12.8% [from 33.55 (95% CI 33.05–34.04) in 1999 to 29.26 (95% CI 28.82–29.69) in 2020 per 100,000 persons, $p < 0.05$]. Poisoning by other opioids (53.2%), heroin (15.1%), and other synthetic narcotics (13.3%) were the most common reasons for narcotic and psychodysfunctional poisoning. While poisoning by benzodiazepines (54.2%) and poisoning: other antiepileptic and sedative-hypnotic drugs (30.7%) were the most common hospital admission reasons for poisoning by antiepileptic, sedative-hypnotic, and antiparkinsonism.

Conclusion: Poisoning by narcotics have increased in England and Wales over the study period, however, poisoning by antiepileptic, sedative-hypnotic, and antiparkinsonism drugs in England and Wales were relatively stable during the same period. Future initiatives and awareness programs to prevent harmful use and drug poisoning by narcotics, sedative-hypnotic and other medications are needed.

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1. Introduction

Drug poisoning can be defined as any harm a person experiences from exposure to medicines. It can be related to drug over-

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doses, drug side effects or the misuse of drugs (World Health Organization, 2023). Drug poisoning can occur intentionally or non-intentionally, and it can be related to over-the-counter medications, prescribed medications or illicit drugs (Haoka et al., 2019). Unintentional poisoning has resulted in more than 500,000 deaths worldwide due to drug overdose (Martins et al., 2015; World Health Organization, 2023).

In numerous countries, drug abuse is a severe issue, particularly among young adults (Zaki et al., 2019). Drug poisoning may occur because of drug abuse, and the risk of drug abuse may increase daily due to several factors, including personal and psychological factors, and behavioural factors, including cannabis and cigarette use (Clark et al., 2017; Krause et al., 2018). Such poisoning can also occur due to

other factors such as polypharmacy, drug interactions, and misuse of medications (Krause et al., 2018; Mainoli et al., 2022).

Drug poisoning is a major cause of attending the emergency department of hospitals in several countries, including the United Kingdom (UK) (Digital, 2023). Drug poisoning may include both prescription medications and over-the-counter medications such as paracetamol (The National Health Service (NHS), 2023). In recent years, there has been a global opioid epidemic (Centre for Disease Control and Prevention (CDC), 2023). In the United States, death related to drug overdose has increased by 30% between 2019 and 2020, and the majority of these deaths have been opioid-related (Centre for Disease Control and Prevention (CDC), 2023). In the UK, according to the Office of National Statistics (ONS), there were around 79.5 deaths per million persons, or 4,561 drug-related deaths, reported in England and Wales in 2020 (Wales, 2023). More than half of all drug-related mortality in the UK was opioid-related (Government, 2023).

Moreover, central nervous system medications accounted for 18.8% of the prescribed medications in England and Wales, (Naser et al., 2022a). They are widely used and prescribed for several indications, including seizures, anxiety, depression, and sedation, and muscle relaxation (Spensley, 1974; Mikosz et al., 2020). Further, their use is associated with minor to major complications, including physical dependence, tolerance, respiratory depression, hospitalizations and death (Benyamin et al., 2008). Hospitalizations are increasingly being caused by prescribing tranquilizers, sedatives, and opioids, especially with the growing issue of ageing and polypharmacy (Coben et al., 2010).

Previous studies that investigated the trend in hospital admissions due to drug poisoning by narcotics and drug poisoning by antiepileptic, sedative-hypnotic, and anti-Parkinson drugs in England and Wales are limited. Understanding the trend in hospital admission due to this issue is important to plan health policy. Thus, this study aimed to investigate the trend of hospital admissions related to poisoning by narcotics and psychodysleptics and poisoning by antiepileptic, sedative-hypnotic, and anti-Parkinson drugs in England and Wales between April 1999 and April 2020.

2. Methods

2.1. Data source and study population

An observational ecological study were conducted using data from the Hospital Episode Statistics (HES) database in England (Hospital Episode Statistics, 2021), and the Patient Episode Database for Wales (Annual PEDW Data Tables, 2021). To identify hospital admissions for poisoning by narcotics and poisoning by antiepileptic, sedative-hypnotic, and antiparkinsonian drugs, the International Statistical Classification of Diseases and Related Health Problems (ICD-10) were used in this study. All diagnostic codes for poisoning by narcotics and psychodysleptics (T40) and poisoning by antiepileptic, sedative-hypnotic, and antiparkinsonism drugs (T42) were used. To calculate the yearly hospital admission rate, mid-year population data for the study period were collected from the ONS.

2.2. Ethical approval

This study used an anonymised data on hospital admissions, demographics, and mortality. In addition, the data used in this study is publicly available.

2.3. Statistical analysis

The rate of hospital admissions with 95% confidence intervals (CIs) was calculated by dividing the number of episodes of poison-

ing by narcotics and psychodysleptics related admission and poisoning by antiepileptic, sedative-hypnotic, and antiparkinsonism drugs-related admission by the mid-year population from the ONS. To assess the difference in the trend of hospital admissions over the study period, the Chi-squared test was used. Data were analysed using SPSS version 27.

3. Results

The study found that the annual number of hospital admissions related to narcotics and psychodysfunctionals poisonings increased by 1.75-fold from [8,188 in 1999 to 22,477 in 2020], with a corresponding increase in hospital admission rate by 1.40-fold increase [from 15.70 (95% CI 15.36–16.04) in 1999 to 37.64 (95% CI 37.15–38.13) in 2020 per 100,000 people, $p < 0.01$]. However, the overall annual number of hospital admissions related to poisonings by antiepileptic, sedative-hypnotic, and antiparkinsonism drugs decreased by 0.1% from [17,491 in 1999 to 17,473 in 2020], with a corresponding decrease in hospital admission rate of 12.8% [from 33.55 (95% CI 33.05–34.04) in 1999 to 29.26 (95% CI 28.82–29.69) in 2020 per 100,000 persons, $p < 0.05$].

As shown in Table 1, the most frequent reasons for hospital admissions related to narcotic and psychodysfunctional poisoning were poisoning by other opioids (53.2%), heroin (15.1%), and other synthetic narcotics (13.3%). Additionally, the most frequent reasons for hospital admissions related to poisoning by antiepileptic, sedative-hypnotic, and antiparkinsonism drugs were poisoning by benzodiazepines (54.2%) and poisoning by other antiepileptic and sedative-hypnotic drugs (30.7%).

The study observed a significant increase in hospital admission rates for several types of narcotic and psychodysfunctional poisoning during the study period, including poisoning by cocaine, other opioids, lysergide (LSD), and other synthetic narcotics, which

Table 1
Percentage of Poisoning by narcotics and psychodysleptics and Poisoning by antiepileptic, sedative-hypnotic and antiparkinsonism drugs hospital admission from total number of admissions per ICD code.

ICD code	Description	Percentage from total number of admissions
Poisoning by narcotics and psychodysleptics		
T40.0	Poisoning: Opium	0.2%
T40.1	Poisoning: Heroin	15.1%
T40.2	Poisoning: Other opioids	53.2%
T40.3	Poisoning: Methadone	4.6%
T40.4	Poisoning: Other synthetic narcotics	13.3%
T40.5	Poisoning: Cocaine	6.4%
T40.6	Poisoning: Other and unspecified narcotics	4.3%
T40.7	Poisoning: Cannabis (derivatives)	1.8%
T40.8	Poisoning: Lysergide [LSD]	0.4%
T40.9	Poisoning: Other and unspecified psychodysleptics	0.6%
Poisoning by antiepileptic, sedative-hypnotic and antiparkinsonism drugs		
T42.0	Poisoning: Hydantoin derivatives	1.8%
T42.1	Poisoning: Iminostilbenes	6.6%
T42.2	Poisoning: Succinimides and oxazolidinediones	0.3%
T42.3	Poisoning: Barbiturates	0.8%
T42.4	Poisoning: Benzodiazepines	54.2%
T42.5	Poisoning: Mixed antiepileptics, not elsewhere classified	0.1%
T42.6	Poisoning: Other antiepileptic and sedative-hypnotic drugs	30.7%
T42.7	Poisoning: Antiepileptic and sedative-hypnotic drugs, unspecified	4.0%
T42.8	Poisoning: Antiparkinsonism drugs and other central muscle-tone depressants	1.5%

ICD International Statistical Classification of Diseases system.

increased by 6.21-fold, 3.32-fold, 1.33-fold, and 1.13-fold, respectively. Hospital admission rates for poisoning by other and unspecified narcotics, cannabis derivatives, and opium also increased by 92.7%, 83.3%, and 37.2%, respectively, while rates for poisoning by other and unspecified psychodysleptics, methadone, and heroin decreased by 41.5%, 79.0%, and 12.0%, respectively (as shown in Fig. 1 and Table 2).

During the study period, there was a significant increase in hospital admission rates for poisoning by mixed antiepileptics, succinimides and oxazolidinediones, and unspecified antiepileptic and sedative-hypnotic drugs, which increased by 3.37-fold, 1.33-fold, and 1.32-fold, respectively.

In addition, the study found an increase in hospital admission rates for poisoning by antiparkinsonian drugs as well as poisoning by other antiepileptic and sedative-hypnotic drugs, with a respective increase of 39.9% and 36.4%. However, hospital admission rates for poisoning by antiepileptic, sedative-hypnotic, and antiparkinsonian drugs for iminostilbenes, hydantoin derivatives, barbiturates, and benzodiazepines decreased by 69.3%, 63.5%, 59.7%, and 27.0%, respectively (as shown in Fig. 2 and Table 2).

3.1. Overall rates of hospital admission stratified by age

3.1.1. Poisoning by narcotics and psychodysleptics

Patients aged 15–59 years accounted for the largest proportion of hospital admissions related to poisoning by narcotics and psychodysleptics, representing 85% of the total number of admissions. The age group 60–74 years accounted for 7% of the admissions, followed by other age groups. Hospital admissions for narcotic and psychodysfunctional poisoning increased 1.30-fold among patients aged 15–59 years [from 23.27 (95%CI 22.74–23.81) in 1999 to 53.50 (95%CI 52.73–54.28) in 2020 per 100,000 people]. Hospital admissions for narcotic and psychodysfunctional Poisoning

increased 5.70-fold among patients aged 60–74 years [from 3.07 (95%CI 2.66–3.48) in 1999 to 20.58 (95%CI 19.66–21.50) in 2020 per 100,000 people]. Rates of hospitalization for narcotic and psychodysfunctional poisoning among patients older than 75 years and up increased 3.97-fold [from 5.03 (95% CI 4.33–5.73) in 1999 to 25.00 (95% CI 23.64–26.36) in 2020 per 100,000 people] (Fig. 3).

3.1.2. Poisoning by antiepileptic, sedative-hypnotic and antiparkinsonism drugs

The study found that around 85% the whole number of admissions were in the age group 15–59 years. The age group 60–74 years accounted for 7% of the admissions, followed by other age groups. Rates of hospital admission for poisoning by antiepileptic, sedative-hypnotic and antiparkinsonism drugs among patients aged below 15 years decreased by 62.6% [from 8.55 (95%CI 7.97–9.12) in 1999 to 3.19 (95%CI 2.86–3.53) in 2020 per 100,000 people]. However, it also fell by 10.0% [from 46.87 (95% CI 46.11–47.62) in 1999 to 42.19 (95% CI 41.50–42.87) in 2020 per 100,000 people] among those aged between 15 and 59. For the age group 60–74 years, the hospital admission rate decreased by 1.6% [from 15.31 (95%CI 14.39–16.23) in 1999 to 15.07 (95%CI 14.29–15.86) in 2020 per 100,000 people]. While for those older than 75 years, the rates of hospital admission decreased by 10.6% [from 21.61 (95%CI 20.15–23.07) in 1999 to 19.31 (95%CI 18.12–20.51) in 2020 per 100,000 people] (Fig. 4).

3.2. Overall rates of hospital admission stratified by gender.

3.2.1. Poisoning by narcotics and psychodysleptics

The overall reported hospital admission episodes for poisoning by narcotics and psychodysleptics in England and Wales were 307,715. Males accounted for 51.5% of the total number of hospital admissions related to poisoning by narcotics and psychodysleptics,

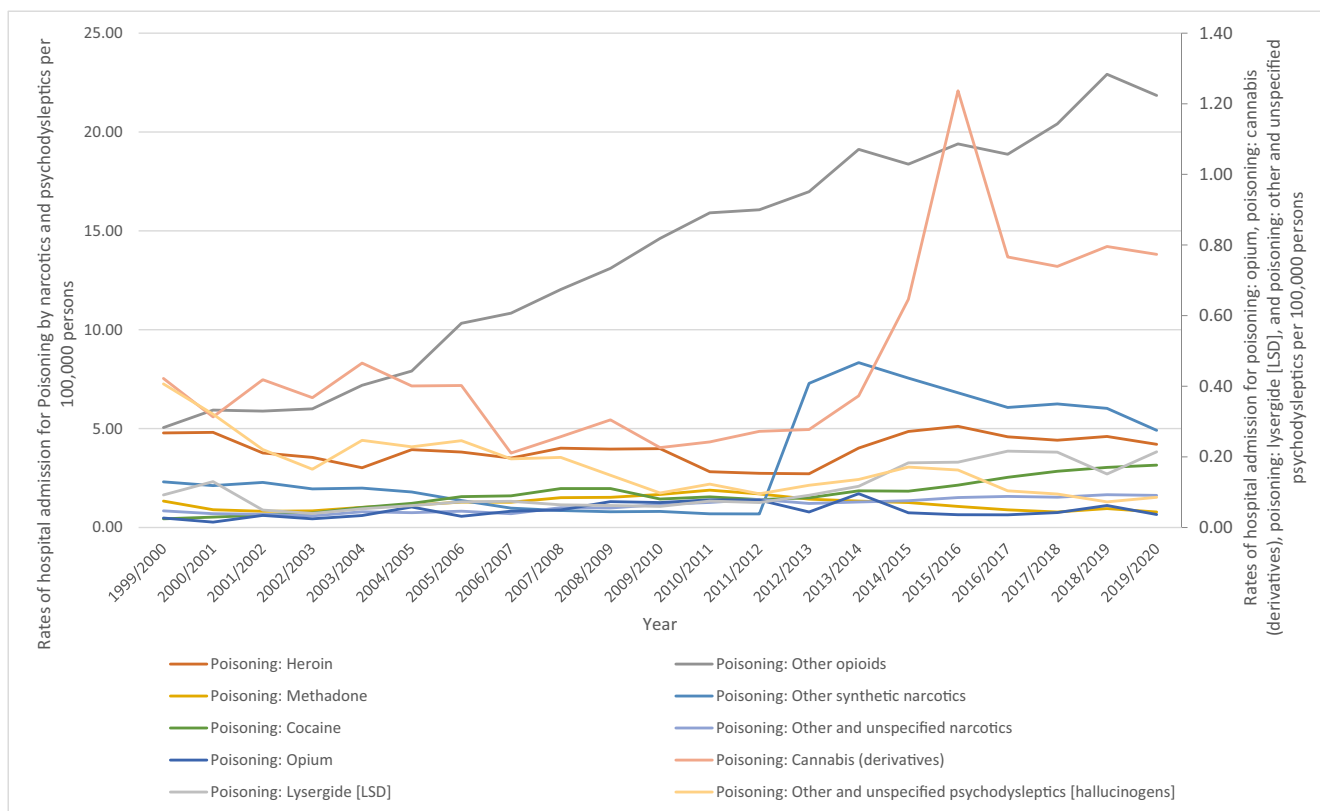


Fig. 1. Rates of hospital admission for Poisoning by narcotics and psychodysleptics in England and Wales stratified by type between 1999 and 2020.

Table 2
Percentage change in the hospital admission rates for Poisoning by narcotics and psychodysleptics and Poisoning by antiepileptic, sedative-hypnotic and antiparkinsonism drugs from 1999 to 2020 in England and Wales.

Poisonings	Rate of poisonings in 1999 per 100,000 persons (95% CI)	Rate of poisonings in 2020 per 100,000 persons (95% CI)	Percentage change from 1999 to 2020
Poisoning by narcotics and psychodysleptics			
Opium	0.03(0.01–0.04)	0.04(0.02–0.05)	37.2%
Heroin	4.78(4.59–4.97)	4.21(4.04–4.37)	–12.0%
Other opioids	5.05(4.86–5.25)	21.85(21.47–22.22)	332.3%
Methadone	1.34(1.24–1.44)	0.78(0.71–0.85)	–41.5%
Other synthetic narcotics	2.31(2.18–2.44)	4.91(4.73–5.09)	113.0%
Cocaine	0.44(0.38–0.49)	3.15(3.01–3.30)	621.4%
Other and unspecified narcotics	0.84(0.76–0.92)	1.62(1.52–1.72)	92.7%
Cannabis (derivatives)	0.42(0.37–0.48)	0.77(0.70–0.84)	83.3%
Lysergide [LSD]	0.09(0.07–0.12)	0.21(0.18–0.25)	132.8%
Other and unspecified psychodysleptics	0.41(0.35–0.46)	0.09(0.06–0.11)	–79.0%
Poisoning by antiepileptic, sedative-hypnotic and antiparkinsonism drugs			
Hydantoin derivatives	0.94(0.85–1.02)	0.34(0.29–0.39)	–63.5%
Iminostilbenes	3.47(3.31–3.63)	1.07(0.98–1.15)	–69.3%
Succinimides and oxazolinediones	0.05(0.03–0.07)	0.12(0.09–0.15)	132.8%
Barbiturates	0.48(0.42–0.54)	0.19(0.16–0.23)	–59.7%
Benzodiazepines	19.88(19.50–20.26)	14.52(14.22–14.83)	–27.0%
Mixed antiepileptics, not elsewhere classified	0.01(0.00–0.02)	0.06(0.04–0.08)	336.5%
Other antiepileptic and sedative-hypnotic drugs	7.17(6.94–7.40)	9.79(9.54–10.04)	36.4%
Antiepileptic and sedative-hypnotic drugs, unspecified	1.10(1.01–1.19)	2.55(2.43–2.68)	132.4%
Antiparkinsonism drugs and other central muscle-tone depressants	0.44(0.38–0.50)	0.61(0.55–0.68)	39.9%

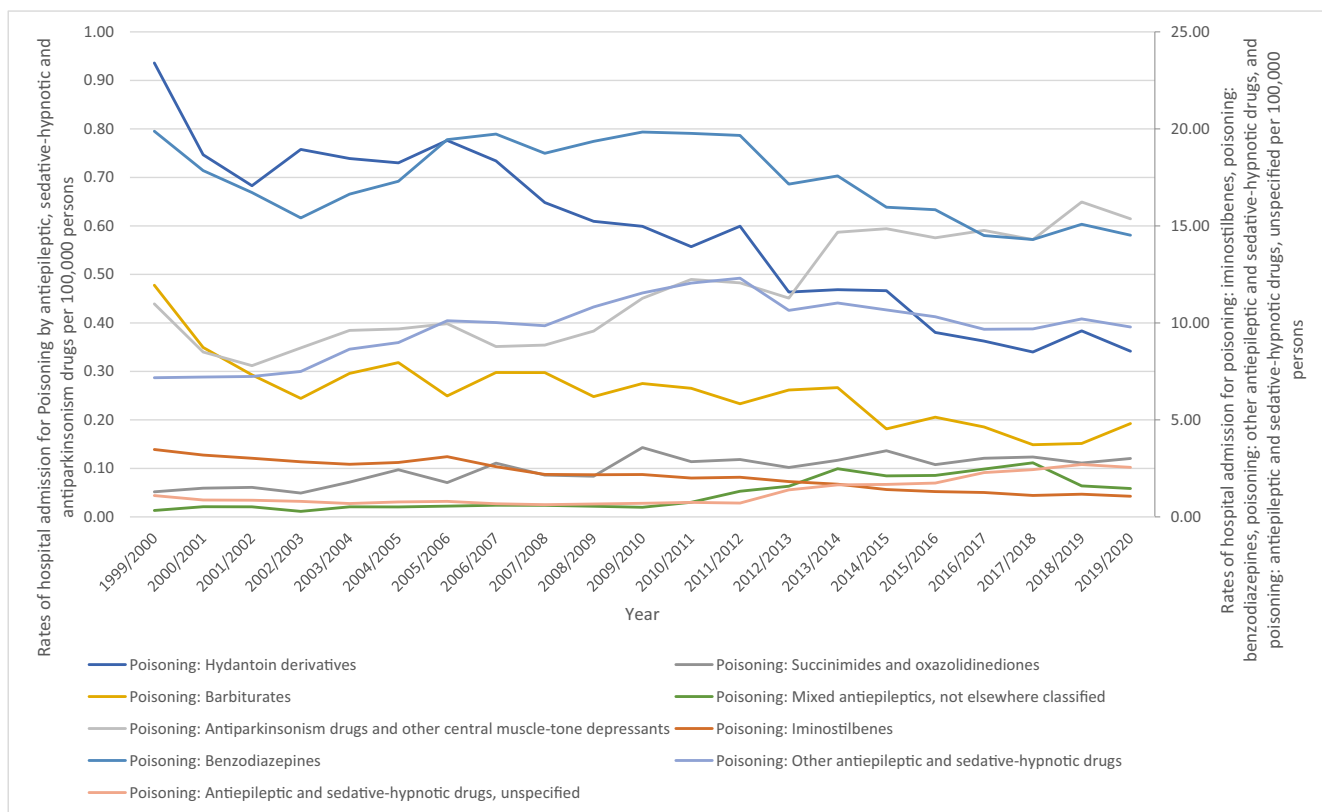


Fig. 2. Rates of hospital admission for Poisoning by antiepileptic, sedative-hypnotic and antiparkinsonism drugs in England and Wales stratified by type between 1999 and 2020.

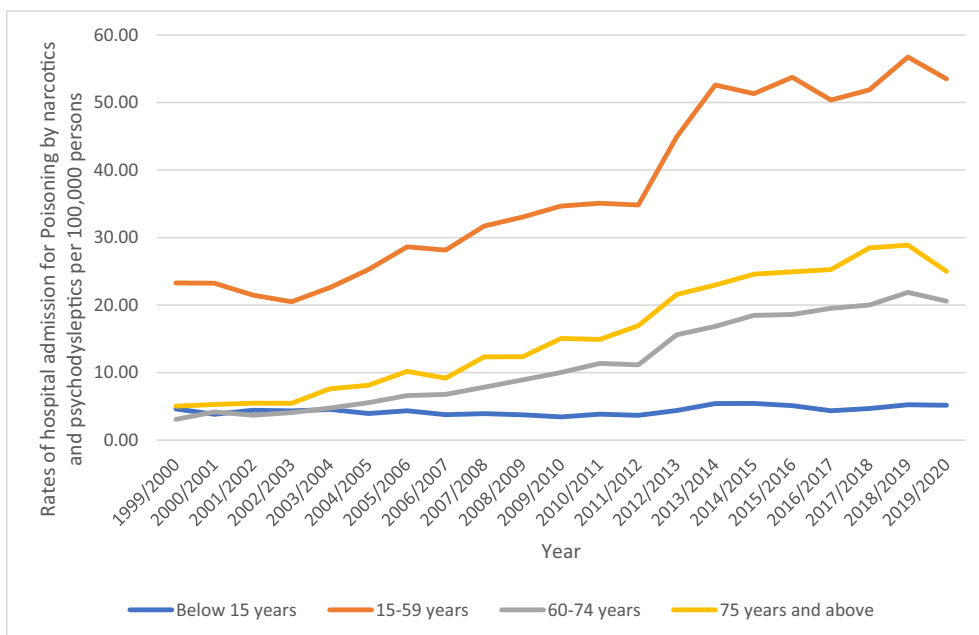


Fig. 3. Rates of hospital admission for Poisoning by narcotics and psychodysleptics in England and Wales stratified by age group.

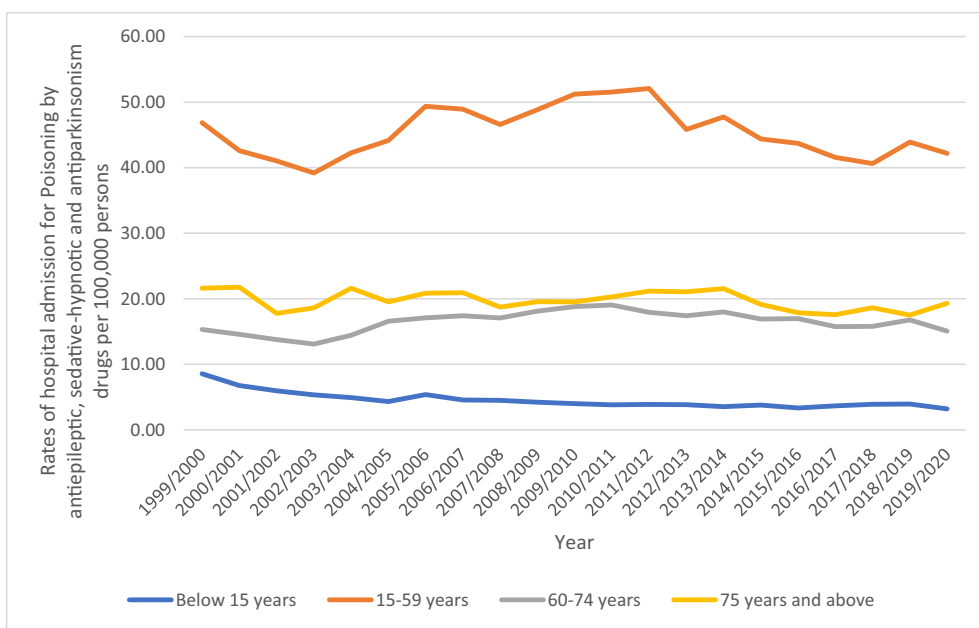


Fig. 4. Rates of hospital admission for Poisoning by antiepileptic, sedative-hypnotic and antiparkinsonism drugs in England and Wales stratified by age group.

with 158,599 hospital admission episodes, averaging 7,552 per year. The hospital admission rate for females poisoned by narcotics and psychodysleptics increased 2.17-fold [from 12.10 (95% CI 11.69–12.52) in 1999 to 38.35 (95% CI 37.65–39.05) in 2020 per 100,000 people]. The hospital admission rate for males poisoned by narcotics and psychodysleptics increased by 89.4% [from 19.48 (95% CI 18.94–20.03) in 1999 to 36.89 (95% CI 36.20–37.58) in 2020 per 100,000 people] (Fig. 5).

3.2.2. Poisoning by antiepileptic, sedative-hypnotic and antiparkinsonism drugs

The overall reported hospital admission episodes for poisoning by antiepileptic, sedative-hypnotic, and antiparkinsonism drugs in

England and Wales were 374,375 admissions. Females accounted for 55.5% of all hospital admissions related to poisoning by antiepileptic, sedative-hypnotic, and antiparkinsonism drugs, with 207,734 hospital admission episodes, averaging 9,892 per year. The male hospital admission rate fell by 16.5% [from 33.15 (95% CI 32.44–33.85) in 1999 to 27.68 (95% CI 27.08–28.28) in 2020 per 100,000 people]. Female hospitalization rates fell by 9.2% [from 33.92 (95% CI 33.22–34.62) in 1999 to 30.79 (95% CI 30.16–31.41) in 2020 per 100,000 people] (Fig. 6).

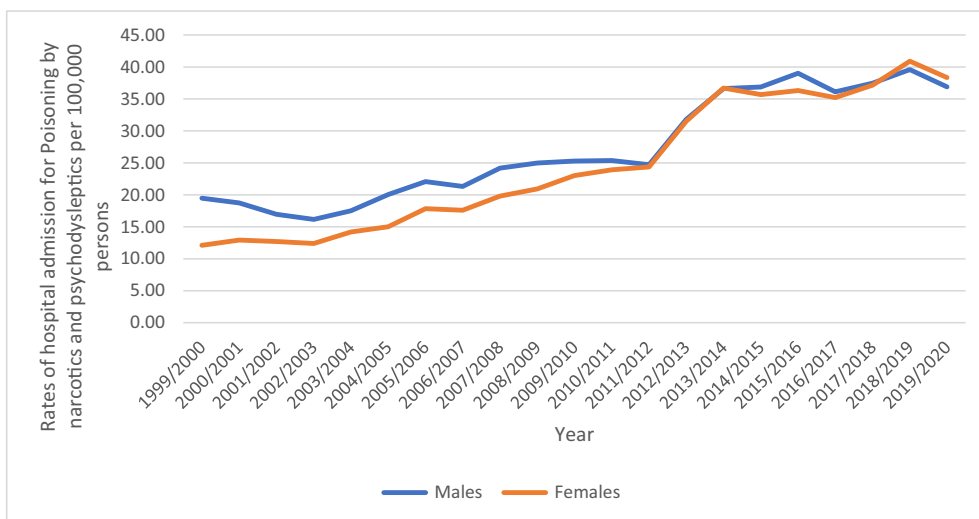


Fig. 5. Rates of hospital admission for Poisoning by narcotics and psychodysleptics in England and Wales stratified by gender.

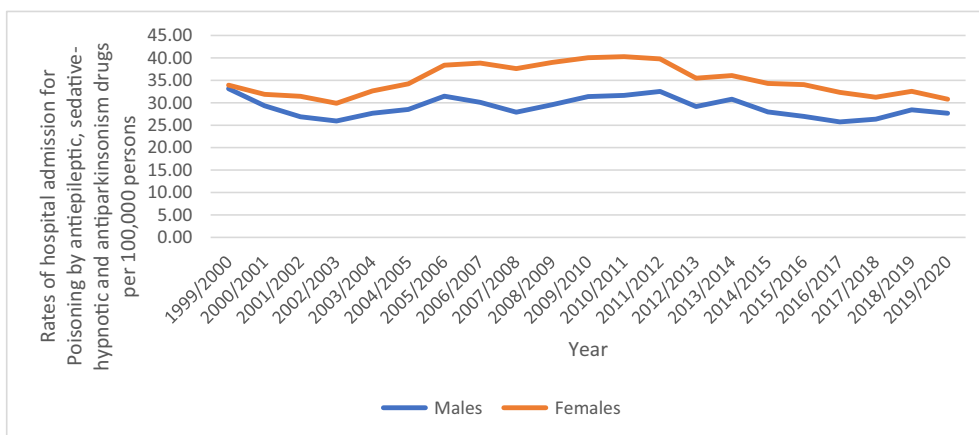


Fig. 6. Rates of hospital admission for Poisoning by antiepileptic, sedative-hypnotic and antiparkinsonism drugs in England and Wales stratified by gender.

3.3. Hospital admission rate by gender

3.3.1. Poisoning by narcotics and psychodysleptics admission rate by gender

The preponderance of poisoning by narcotics and psychodysleptics hospital admission rates were higher among males compared to females. These include the following: poisoning: heroin; methadone; cocaine and cannabis (Fig. 7). However, females had higher hospital admission rates for poisoning: opium, poisoning: other opioids, and poisoning: other synthetic narcotics (Fig. 7).

3.3.2. Poisoning by antiepileptic, sedative-hypnotic and antiparkinsonism drugs admission rate by gender

Females had a higher trend of poisoning by antiepileptic, sedative-hypnotic, and antiparkinsonism drugs females compared to males, which included the following: Succinimide and oxazolinedione poisoning; barbiturates poisoning; benzodiazepines poisoning; and antiparkinsonism drugs and other central muscle-tone depressants poisoning (Fig. 8). Nonetheless, males had higher hospital admission rates for poisoning by antiepileptic, sedative-hypnotic, and antiparkinsonian drugs, as well as poisoning by iminostilbenes (Fig. 8).

3.4. Hospital admission rate by age

3.4.1. Poisoning by narcotics and psychodysleptics admission rate by age group

Hospital admissions due to poisoning: opium was more common among the older age groups. Hospital admissions due to poisoning: other opioids and poisoning: other synthetic narcotics were more common among the age groups older age group (Fig. 9).

3.4.2. Poisoning by antiepileptic, sedative-hypnotic and antiparkinsonism drugs admission rate by age group

The study showed that hospital admissions related to poisoning by hydantoin derivatives, barbiturates, poisoning, antiparkinsonism and drugs were directly related to age, with a higher proportion of admissions occurring in the age group of 75 years and above (Fig. 10).

4. Discussion

This ecological study investigated the trend of hospital admissions related to poisoning by narcotics and psychodysleptics and poisoning by antiepileptic, sedative-hypnotic, and anti-Parkinson drugs in England and Wales over 20 years. It was found that the

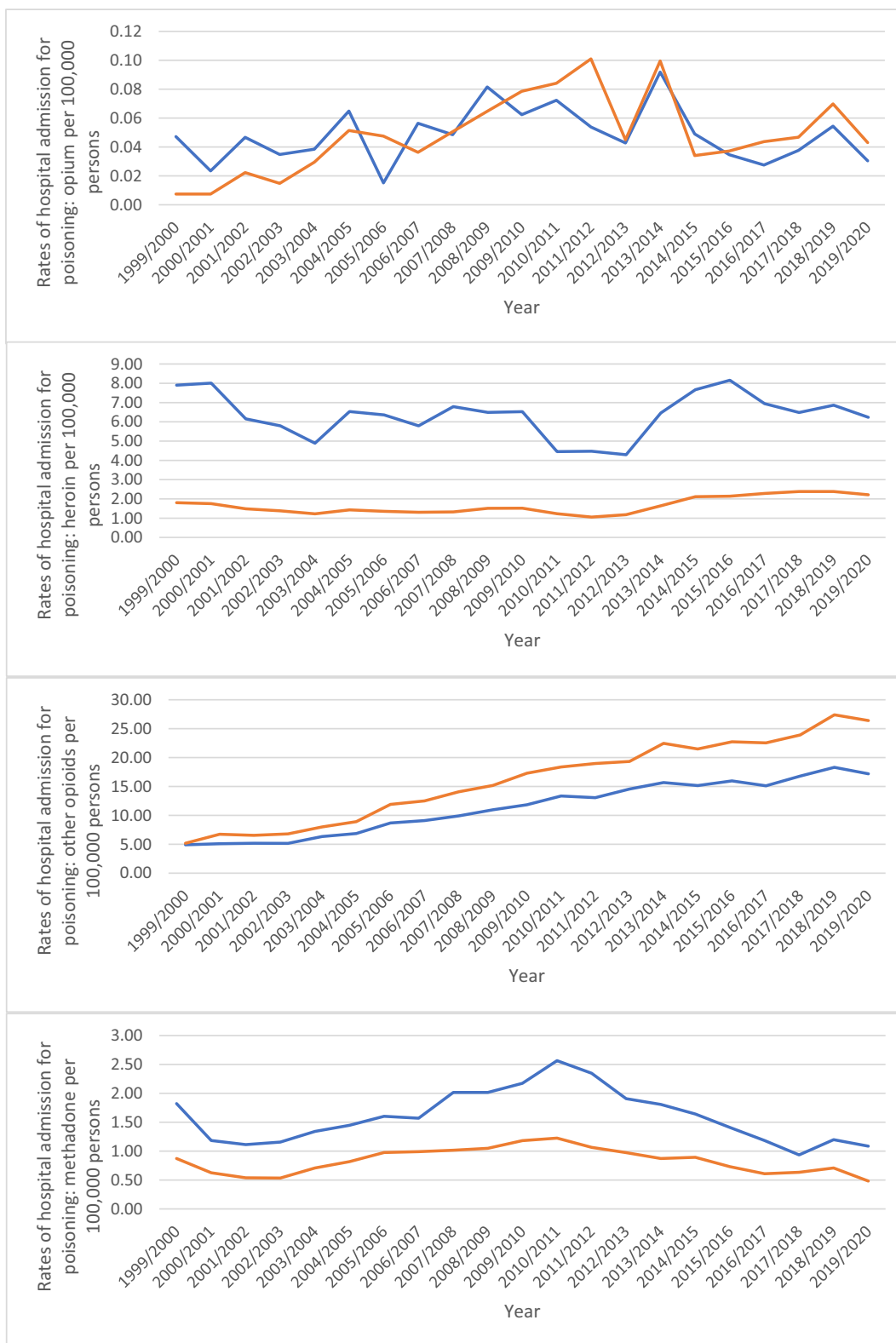


Fig. 7. Hospital admission rates for Poisoning by narcotics and psychodysleptics in England and Wales stratified by gender.

total annual number of hospital admissions for narcotic and psycho-dysfunctional poisonings increased by 1.4-fold [from 15.70 (95% CI 15.36–16.04) in 1999 to 37.64 (95% CI 37.15–38.13) in 2020 per 100,000 people, $p < 0.01$]. However, the overall annual number of poisonings by antiepileptic, sedative-hypnotic and anti-Parkinson drug hospital admissions for various reasons

decreased by 12.8% [from 33.55 (95% CI 33.05–34.04) in 1999 to 29.26 (95% CI 28.82–29.69) in 2020 per 100,000 persons, $p < 0.05$]. The most frequent reasons for narcotic and psycho-dysfunctional poisoning hospital admissions were poisoning by other opioids (53.2%), heroin (15.1%), and other synthetic narcotics (13.3%). While the most common reasons for hospital admission

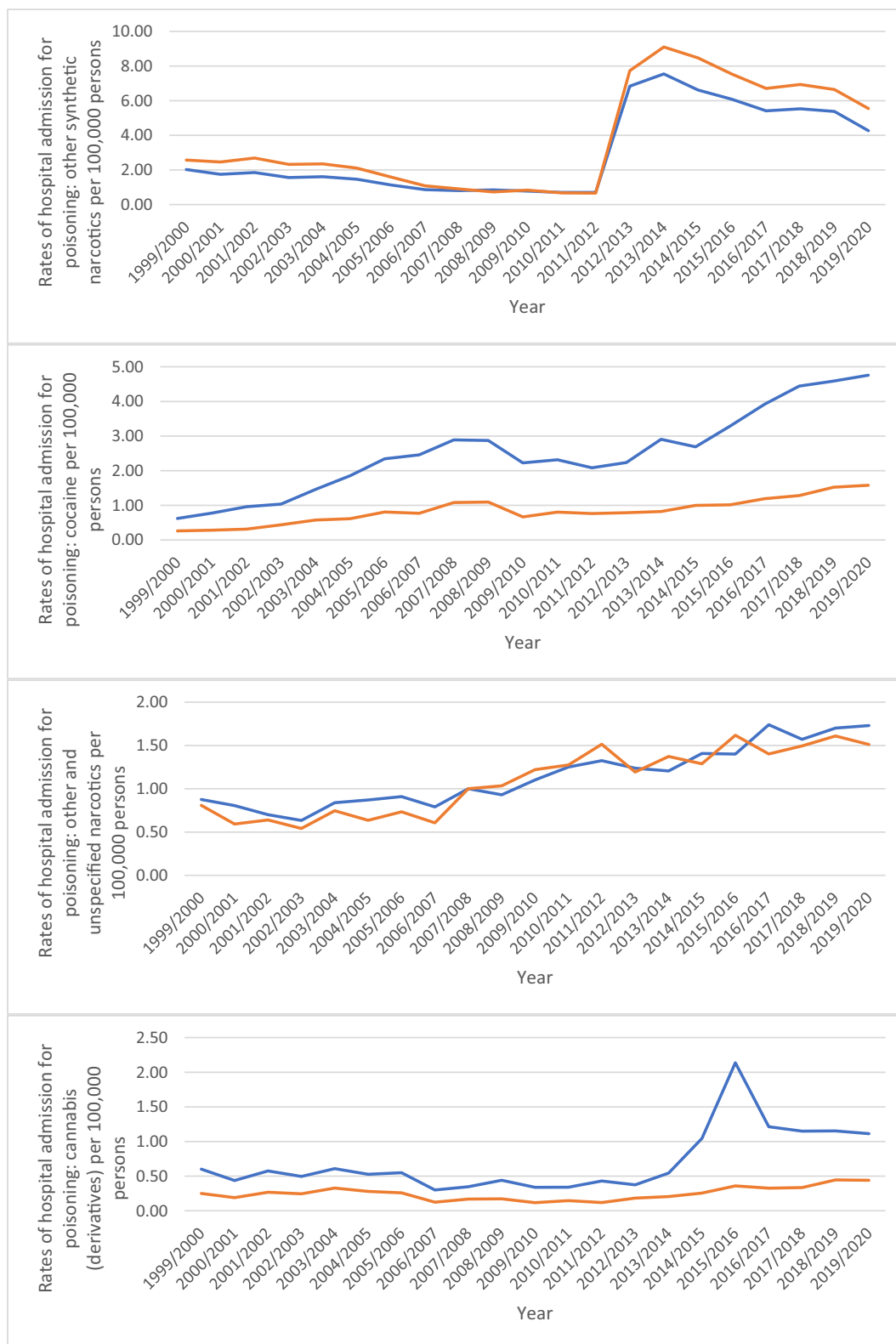


Fig. 7 (continued)

for poisoning other than by antiepileptic, sedative-hypnotic, and anti-Parkinson drugs were poisoning by benzodiazepines (54.2%) and other antiepileptic and sedative-hypnotic drugs (30.7%).

In the last 20 years, there has been a sharp increase in the trend of poisoning, misuse, hospital admissions and mortality related to

the use of narcotics (Jani et al., 2020; Singh and Cleveland, 2020; Friebel and Maynou, 2022). One study reported that opioid-related hospitalizations increased by 48.9% between 2008 and 2018 (Friebel and Maynou, 2022). Similar findings were also reported in the United States, where Singh et al. reported that



Fig. 7 (continued)

opioid-related hospitalizations increased over the study period (1998–2016) (Singh and Cleveland, 2020). These results are consistent with the findings of the current study as it was found that the overall annual number of hospital admissions for narcotics and psycho-dysfunctional poisonings increased by 1.4-fold [from 15.70 (95% CI 15.36–16.04) in 1999 to 37.64 (95% CI 37.15–38.13) in 2020 per 100,000 people, $p < 0.01$]. These findings can be attributed to several factors, including an increased supply of drugs, an increase in the incidence of mental health issues, and cultural and social issues (Ciccarone, 2021). It may also be due to over-prescribing issues (Abbasi et al., 2019).

According to the National Institute of Drug Abuse (NIDA), more than 49.2% of people in the US had used illicit drugs at least once in their lifetime, and the majority of these drugs fall under the category of opioids (The National Institute on Drug Abuse (NIDA) 2018). In addition, the Centre for Disease Control and Prevention (CDC) also reported that the number of mortalities related to drug overdose increased by 30% between 2019 and 2020. This is a significant increase since 1999, and the majority of drug overdoses are related to opioid use (Centre for Disease Control and Prevention (CDC), 2023). The findings of this research are consistent with the results reported in the US as it was found that the most common reasons for narcotic and psycho-dysfunctional poisoning hospital admissions were the result of poisoning by other opioids (53.2%), heroin (15.1%), and other synthetic narcotics (13.3%).

In this study, hospital admission rates for poisoning by narcotics and psycho-dysfunctionals and cannabis (derivatives) increased by 92.7% and 83.3%, respectively. According to the International Classification of Diseases (ICD), other synthetic narcotics include tramadol and fentanyl, both of which are commonly associated with drug overdose hospitalizations and increased risk of mortality (Centre for Disease Control and Prevention (CDC), 2023). Cannabis is widely used worldwide, and previous studies have reported an increase in its use in Europe in the last 20 years

(Hasin and Walsh, 2021; Manthey et al., 2021). The use of cannabis is associated with a high risk of complications, including cognitive impairment, psychosis and respiratory diseases (Manthey et al., 2021). Despite this, in the UK, the medical prescribing of cannabis-based products is legal, even though it is very limited. It is thought that the high rate of hospital admissions due to cannabis can only be explained by the misuse of these products (Hamilton et al., 2014; Vozoris et al., 2022).

This study also found that hospital admission rates for poisoning by narcotics and psychodysleptics by other unspecified psychodysleptics, poisoning by methadone, and poisoning by heroin decreased by 79.0%, 41.5%, and 12.0% during the same study period, respectively. A possible explanation for this finding matches a published report by the CDC, where the authors divided a line graph showing the utilization of opioids in the last 20 years into three waves. Interestingly, heroin-related hospitalization and mortality have decreased in the last five years. This can be explained by the fact that more potent, cheaper and more addictive opioids, such as fentanyl, have become increasingly available in the UK (Zirui, 2017). Another reason to explain the increase in fentanyl use compared to the downtrend of heroin is the supply and demand chain, where more fentanyl has become available in the streets in comparison to heroin in the last few years (Ciccarone, 2021). In addition, social and cultural factors are important factors in addiction. For example, it has been speculated that the significant wave of heroin use in the US during the 70 s was largely driven by social and environmental factors (Ciccarone, 2019).

The trend in the use of anti-Parkinson drugs, benzodiazepines and sedative-hypnotic drugs has increased worldwide (Kim et al., 2018; Torres-Bondia et al., 2020; Milani et al., 2021). However, unlike poisoning by narcotics, this study has shown that the overall annual number of poisonings by antiepileptic, sedative-hypnotic and anti-Parkinson drug hospital admissions, for various reasons, has decreased by 0.1% [from 33.55 (95% CI 33.05–34.04) in 1999



Fig. 8. Hospital admission rates for Poisoning by antiepileptic, sedative-hypnotic and antiparkinsonism drugs in England and Wales stratified by gender.

to 29.26 (95% CI 28.82–29.69) in 2020 per 100,000 persons, $p < 0.05$]. In this study, benzodiazepines and other antiepileptic and sedative-hypnotic drugs accounted for more than 80% of poisonings in hospital admissions. The reduction in the trend of these medications can be attributed to the fact that they are usually cat-

egorized as prescribed drugs for medical indications such as anxiety, depression and sleep disorders. This implies that there may be better control and awareness of their side effects and, therefore, less risk of hospitalization and complications regarding their use (Milani et al., 2021). In addition, this could also be due to changes

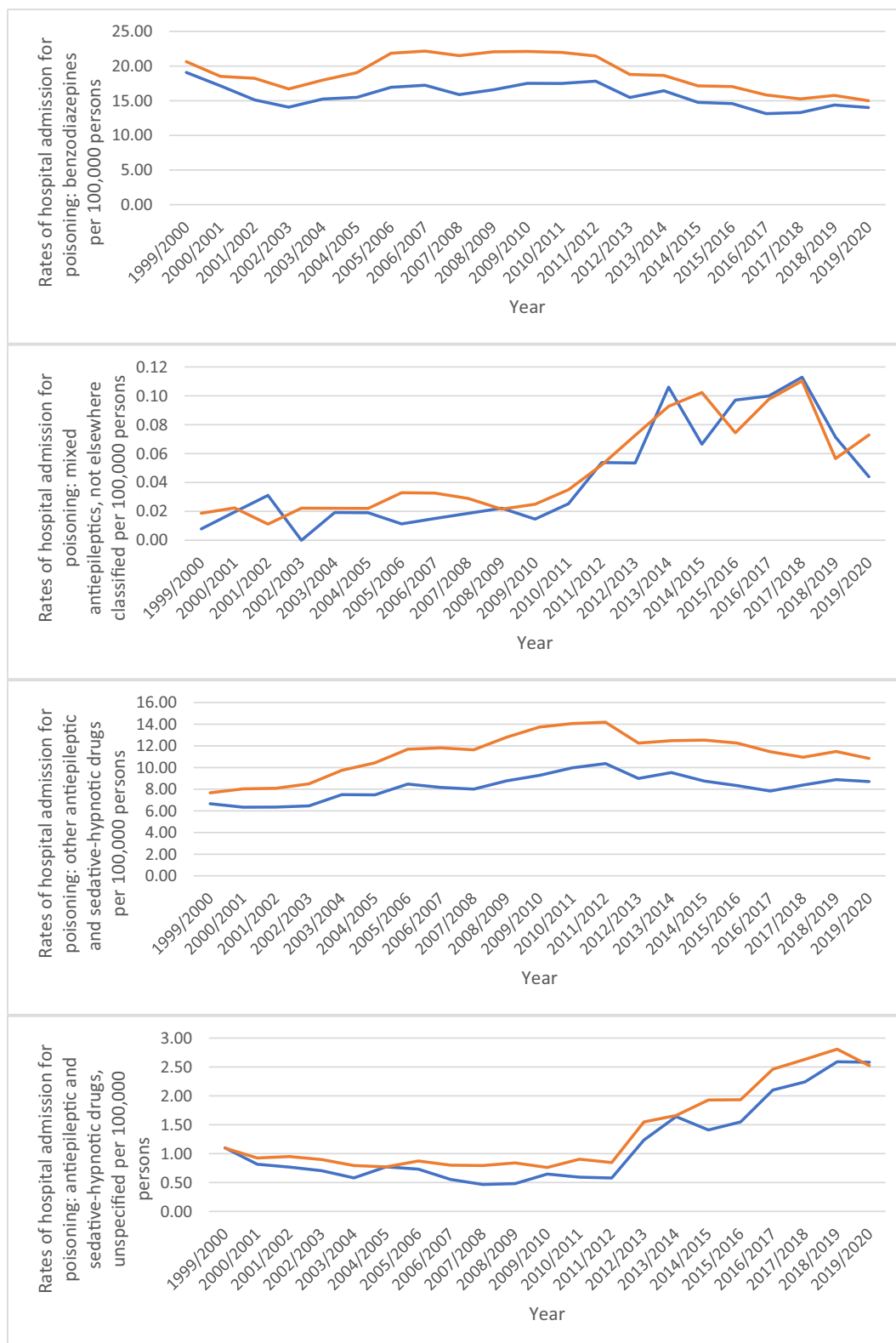


Fig. 8 (continued)

in the treatment practice in the UK as there has been a reduction in the number of annual incidences of epilepsy here (Meeraus et al., 2013).

This study did not find a major difference in gender variation in hospital admission related to poisoning by narcotics and psy-

chodysleptics or hospital admissions related to poisoning by antiepileptic, sedative-hypnotic and anti-Parkinson drugs. Our results are consistent with the previous studies showing a narrowing gap between males and females in the misuse of narcotics and sedative medications, and substance misuse (Jones et al., 2015).

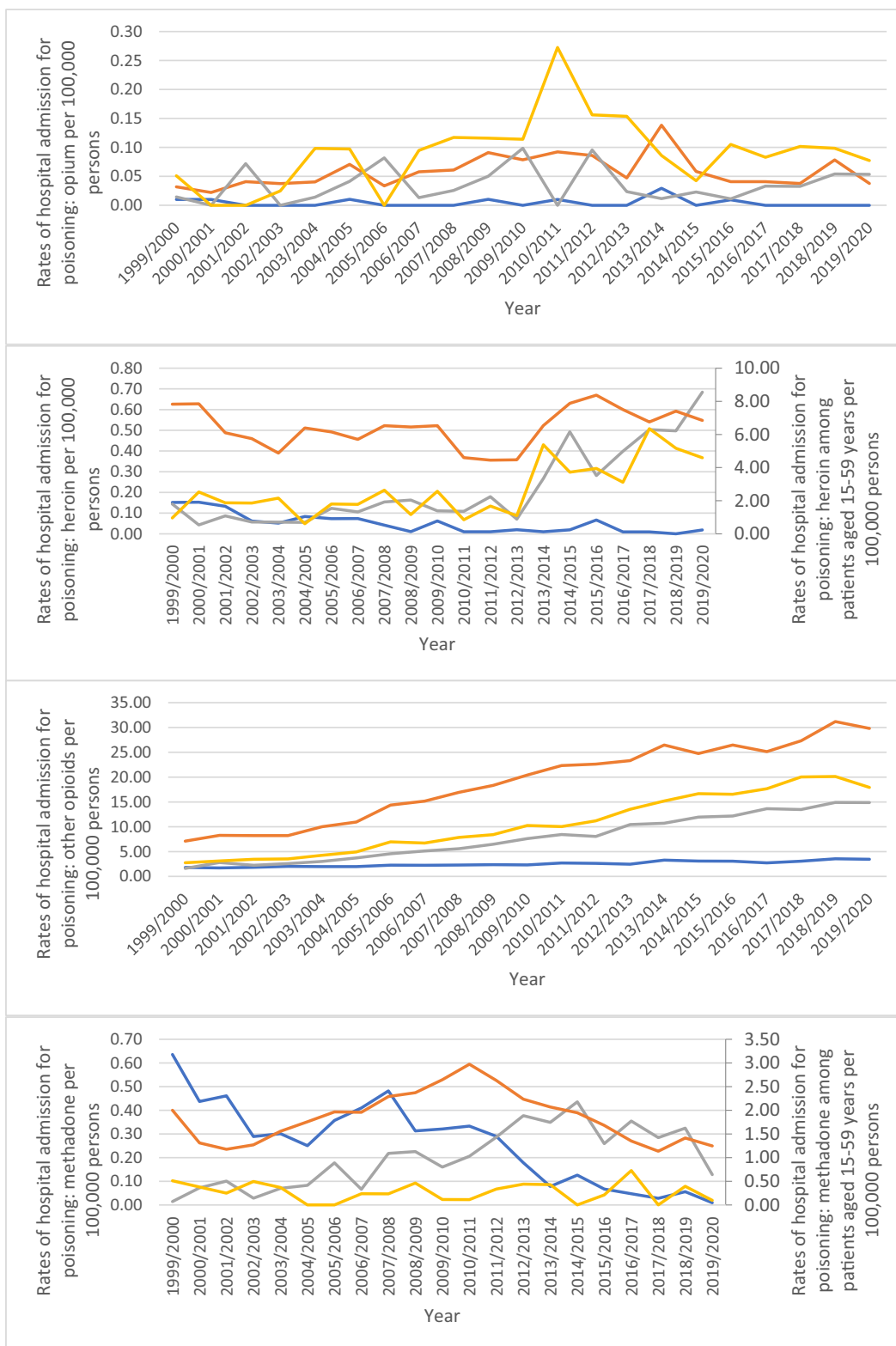


Fig. 9. Hospital admission rates for Poisoning by narcotics and psychodysleptics in England and Wales stratified by age group.

Historically, males were known for higher rates of misuse compared to females. However, in recent years, these differences have narrowed, which can be attributed to several factors, including psychological, social or cultural factors. For example, females tend to have higher rates of depression and anxiety compared to males (McHugh et al., 2021).

In this study, patients between 15 and 59 years accounted for 85% of the total number of poisonings by narcotics and psychodysleptics and poisonings by antiepileptic, sedative-hypnotic and anti-Parkinson drugs hospital admissions. This finding is consistent with previous studies that have investigated the trend in opioid use in the UK and the US (Gomes et al., 2018; Friebel and

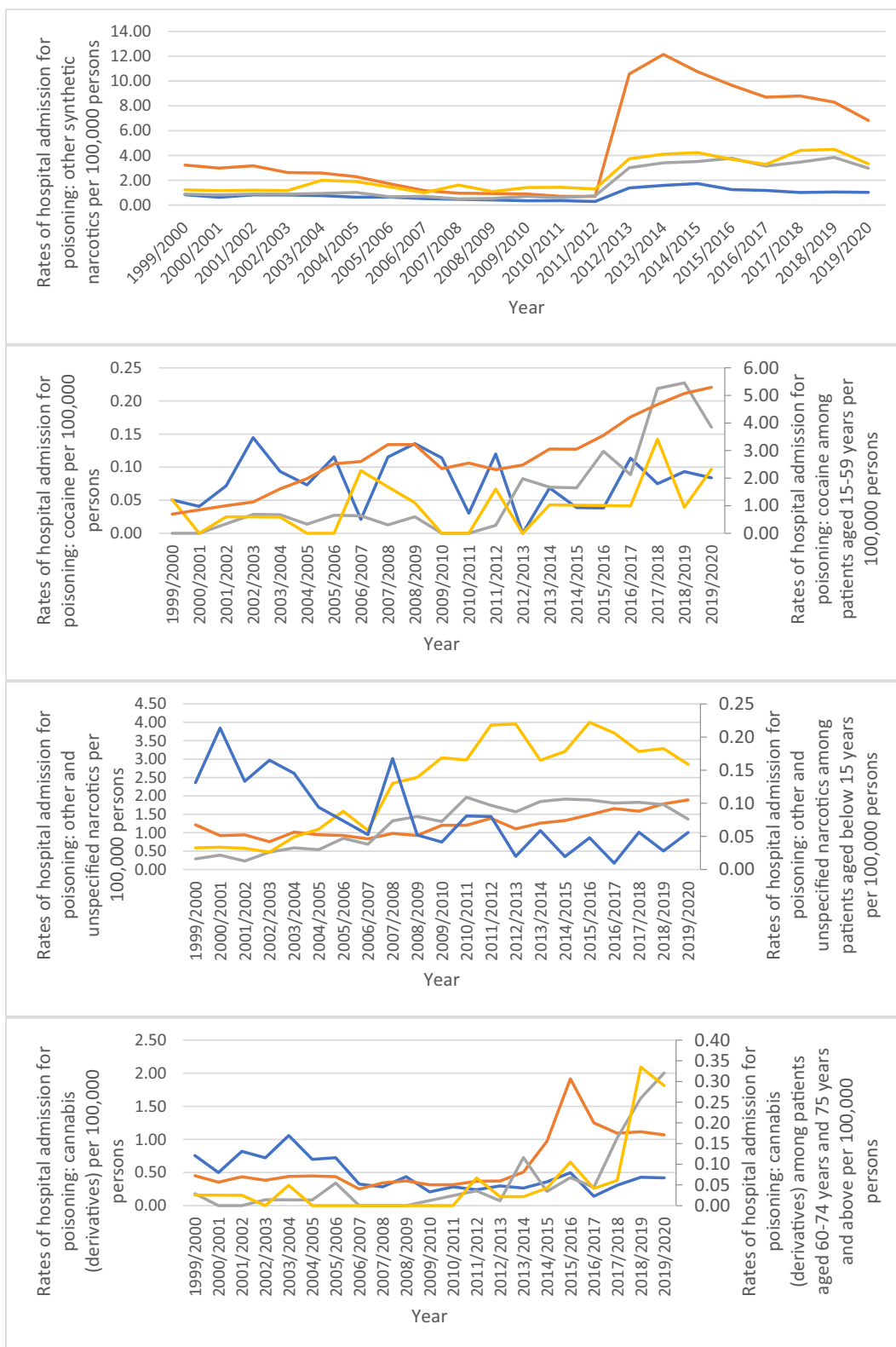


Fig. 9 (continued)

Maynou, 2022). In addition, a previous report that was published by the NHS showed that young adults aged 25 to 34 had the highest hospital admission rates for drug poisoning, followed by those aged 35 to 44 (Digital, 2023). This can be attributed to several factors, including a high prevalence of mental issues (including

depression and anxiety), and socioeconomic status and behavioural problems among this age group. In addition, the older age groups usually tend to use prescribed opioids and controlled medications. Thus, in some cases, the addiction and misuse of medications in this age group can be mistaken for depression and

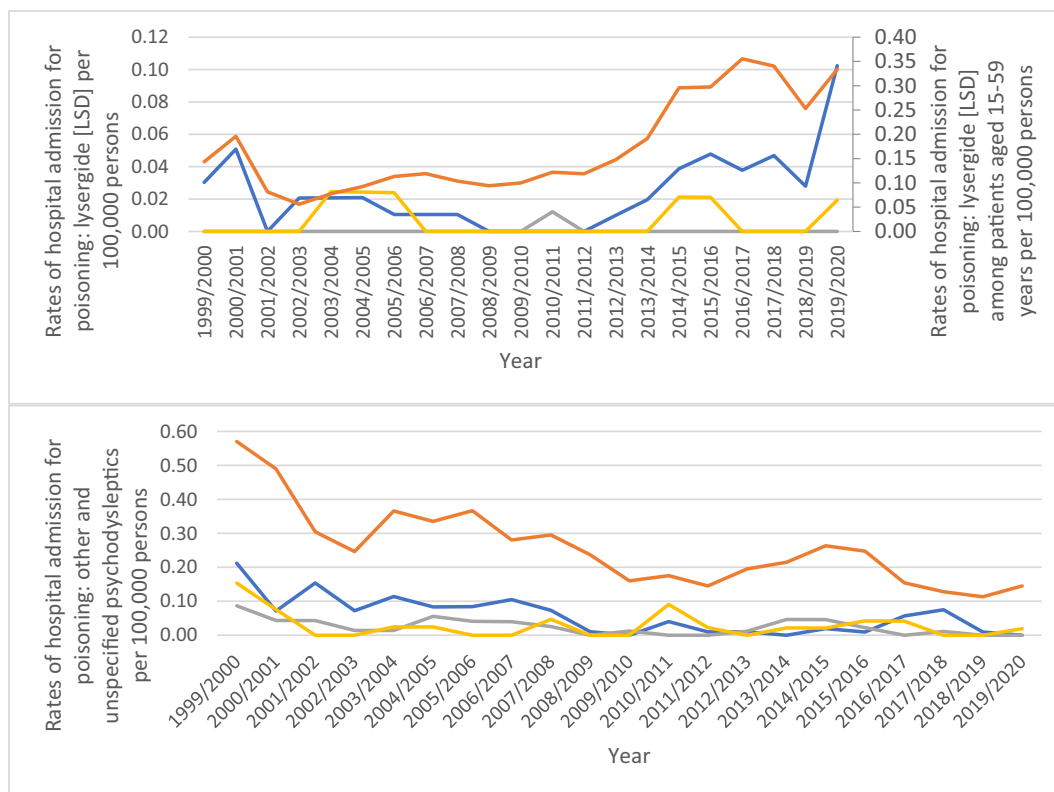


Fig. 9 (continued)

dementia (Koechl et al., 2012). However, it is important to highlight that the age group (15 to 59) is wide, and it includes both young adults and adults, both of which groups are associated with the use of prescribed and non-prescribed narcotics, antiepileptics, sedative-hypnotics and anti-Parkinson drugs for either medical indication or illegal use, making it difficult to draw any conclusions.

The results of this study showed that patients who are older than 60 years had also a high rate of hospital admissions due to drug poisoning by narcotics and psychodysleptics and poisonings by antiepileptics, sedative-hypnotics and anti-Parkinson drugs. However, the use of illicit drugs can always be associated with an increased risk of hospitalization, as can other causes, such as polypharmacy and the misuse of prescription drugs, especially among this age group (Christopher et al., 2022).

The findings of this study are alarming, especially concerning the ageing population, as they may be reflecting an ageing population with an increasing prevalence of narcotic use, which may lead to poor outcomes and consequences. The findings highlight the need to expand and initiate specific programmes and policies to prevent future harmful use of narcotics. In addition, the study also highlights the importance of implementing educational and awareness programmes to avoid polypharmacy and the misuse of prescribing, especially among high-risk individuals who are more prone to hospitalization. This may require an increased budget and government funds for medical research to help better understand the social and behavioural aspects of this population. In addition, expenditure on treatment and care of this population may

need to be increased to help in preventing poor outcomes. In addition, implementing focused policies regarding criminal justice and over-prescribing may help in preventing the uptrend of opioid use.

This study has investigated the trend of hospital admissions related to poisoning by narcotics and psychodysleptics and poisoning by antiepileptic, sedative-hypnotic, and anti-Parkinson drugs in England and Wales over 20 years. This study used ICD codes for the identification of the study outcomes, which enabled us to provide accurate rates of hospital admission over the study period (Quan et al., 2008). In addition, it investigated the trend of drug poisoning, including data on gender and age stratification. However, this study has some limitations. One of the primary limitations is that we did not account for patient-level variables, such as comorbidities and the long-term use of medication, due to the type of data used. Secondly, due to the nature of the supplied data, we were unable to investigate the hospitalization pattern based on different age categories. However, we were able to categorize the patients based on age into four categories. Therefore, we assume that this is unlikely to affect our overall conclusion. In addition, this study used hospital data which was subject to overestimation or under-reporting because of coding errors. However, HES data has been validated in medical research and it has been used in studies reporting adverse effects and hospital admissions (Naser et al., 2022b; Naser et al., 2022c; Alwafi et al., 2023). Furthermore, this study only investigated hospital admission data, and we did not investigate discharged cases from the emergency department. Future studies should investigate both settings to have a better understanding of the problem.



Fig. 10. Hospital admission rates for Poisoning by antiepileptic, sedative-hypnotic and antiparkinsonism drugs in England and Wales stratified by age group.

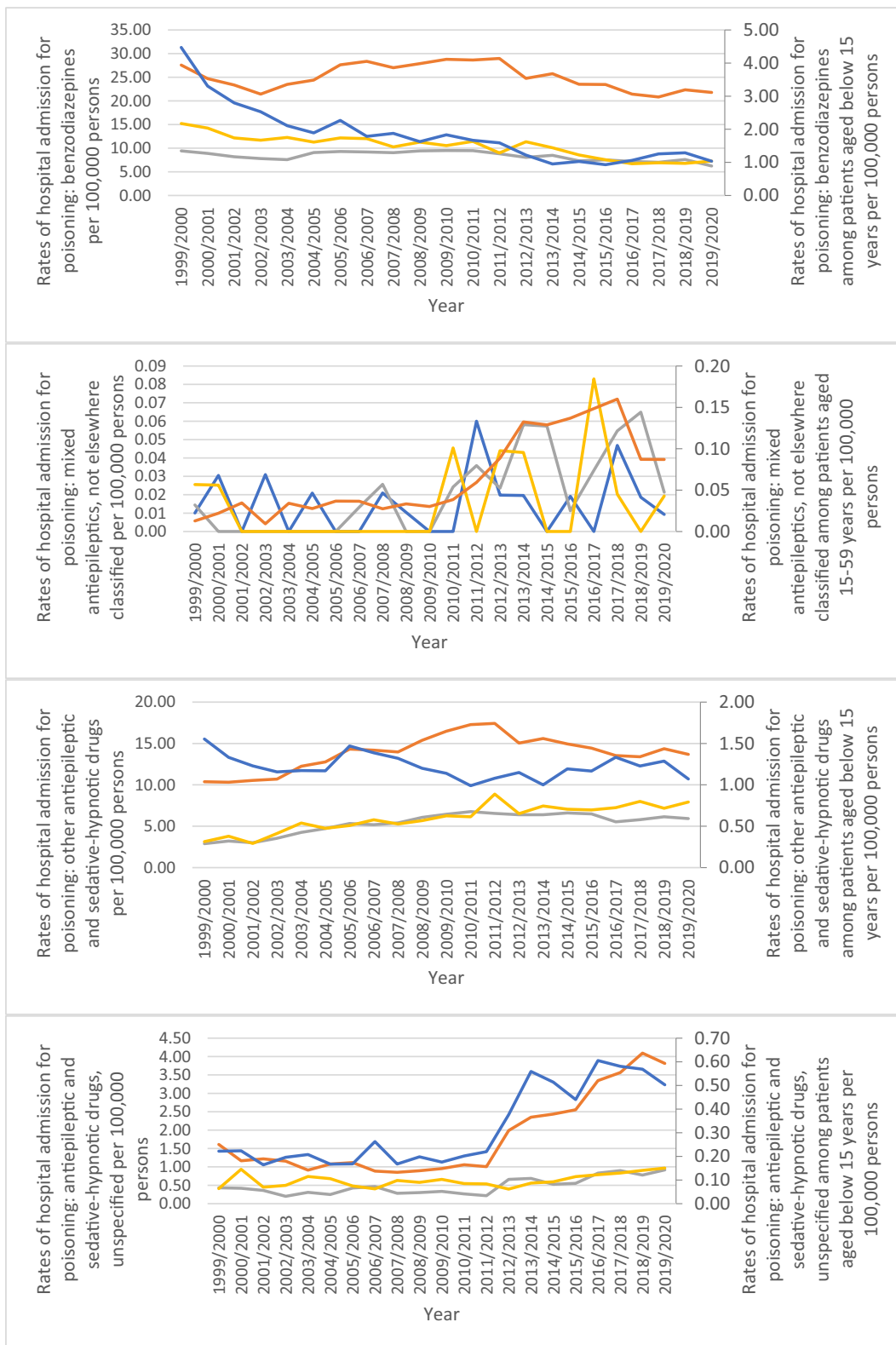


Fig. 10 (continued)

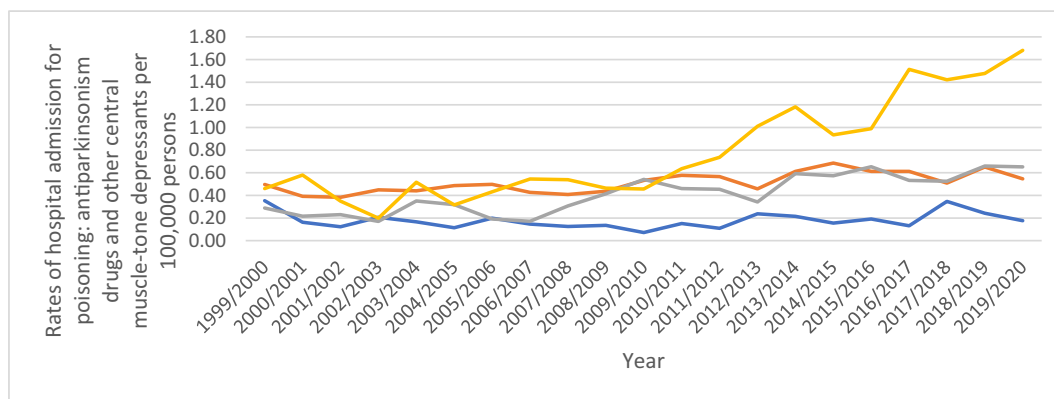


Fig. 10 (continued)

5. Conclusion

This study found that poisoning by narcotics has increased in England and Wales over the study period, while the trend of poisoning by antiepileptic, sedative-hypnotic, and anti-Parkinson drugs in England and Wales has been relatively stable during the same period. Future initiatives and awareness programmes to prevent future misuse, harmful use and drug poisoning by narcotics, sedative-hypnotics and other medications are needed.

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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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