BMJ Open

Investigating outcomes in a substance use treatment provider: a cross-sectional comparison of long-acting injectable buprenorphine and oral medication for opioid use disorder

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To cite: Montgomery C, Abbasi Y, De Silva D, *et al*. Investigating outcomes in a substance use treatment provider: a cross-sectional comparison of long-acting injectable buprenorphine and oral medication for opioid use disorder. *BMJ Open* 2025;**15**:e090736. doi:10.1136/bmjopen-2024-090736

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (https://doi.org/10.1136/bmjopen-2024-090736).

Received 02 July 2024
Accepted 27 January 2025

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ABSTRACT

Objectives Advances in the treatment of opioid use disorder (OUD) have seen the development of long-acting injectable opioid substitutes which could improve outcomes for people with OUD. However, comparative quantitative analysis of individual outcomes is lacking. The present study sought to investigate factors associated with prescribing long-acting injectable buprenorphine (LAIB), and changes in outcome variables compared with oral medication for OUD.

Design Cross-sectional retrospective analysis of electronic health records.

Setting Community substance use treatment service Via. Six sites shared their data between 15 August 2022 and 15 August 2023.

Participants Anonymised data were extracted for 235 people receiving LAIB and 266 people receiving oral medication for OUD.

Primary and secondary outcomes Prescribing data, sociodemographic information (age, sex, indices of multiple deprivation decile of individual's residence, primary and secondary substance, number of previous treatment episodes, employment and ethnicity) and treatment outcome profiles (substance use, physical and mental health, quality of life, employment) were extracted and analysed. To examine predictors of receiving LAIB (vs medication for OUD), we conducted logistic regression including the demographic predictors. Psychological health, physical health and quality of life scores were analysed using Welch's t-tests.

Results LAIB was associated with positive changes in quality of life between the first and last assessments. Demographic and situational factors were predictors of LAIB initiation, indicating the potential for increasing health inequalities in substance use treatment.

Conclusions LAIB is associated with changes in quality of life over a 1-year period. Further research is needed to investigate the aetiology of improved well-being and outcomes over time.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This analysis provides a characterisation of how standardised outcomes change in a 1-year period of treatment for opioid use disorder (OUD).
⇒ The analysis incorporates individual, demographic and situational factors to allow us to assess health inequalities in initiation of treatment.
⇒ The data is limited in that it only gives us a snapshot of subjective well-being over a 1-year period.
⇒ The data cannot tell us qualitatively how the quality of life and perceived psychological well-being changed in the long-acting injectable buprenorphine versus medication for OUD groups.

INTRODUCTION

Opioid use disorder (OUD is defined as a chronic relapsing disorder causing clinically significant distress or impairment and includes opioid dependence, with addiction representing the most severe form of OUD.[1 2] Additional adverse health complications of OUD causing morbidity and mortality centre on blood-borne virus infection (HIV, hepatitis C), overdose, accidents, suicide and poly use of other drugs.[3–5] OUD is treated with opioid substitutes as first-line treatment (usually with methadone or buprenorphine)[6–9] though pharmacological treatment is advised to be integrated within a global therapeutic model focused on recovery and including psychosocial support.[10] Research has demonstrated that treatment with opioid agonist medications such as methadone or buprenorphine reduces mortality by around 50% in people with OUD[11–13] with reductions in overdose deaths and all-cause mortality for those retained in treatment.[14] While effective engagement and retention are crucial for better treatment outcomes including reduced opioid use[5] and reduced risk behaviours,[15] high rates of dropout are observed in the early phases of treatment.[16 17] Premature

disengagement, particularly in the first month of treatment and post treatment completion, is associated with significant increases in mortality risk.[3 18] Thus, there is a need to understand if different medications for opioid use disorder (MOUD) are better at promoting treatment retention and improving outcomes.

Despite methadone and buprenorphine being associated with lower mortality, there are a number of individual factors which can limit the impact of these OUD treatment modalities. For example, people with OUD report that daily mandatory consumption can impact on well-being and opportunities for employment[19 20] and increase stigma and discrimination.[21] In recent years, extended-release subcutaneous injectable buprenorphine formulations (long-acting injectable buprenorphine; LAIB) have been proposed as offering improved rates of retention and adherence.[22–24] LAIB preparations have the potential to be highly effective due to their long-acting bioavailability and limited risk of diversion.[25 26] Moreover, they are ideal for individuals who do not wish to take daily oral doses, people living in rural areas, people in places where safe storage is problematic (eg, people experiencing street homelessness) or people who are at increased risk of overdose, after, for example, release from prison or hospital.[27] In one study, LAIB has been shown to be more effective at increasing abstinence than placebo plus counselling alone[28] which the authors suggest is due to the reduction of risk of missed doses due to medication loss, lapses or diversion.

While there is an evidence base for patient experiences of using methadone and sublingual buprenorphine, due to their relative novelty, there are fewer studies on lived experiences of LAIB, with studies in the USA, Australia and France reporting varied perspectives. In previous research, people have reported that perceived benefits of LAIB include improved choice, reduced travel, clinic and pharmacy attendance and potential for reduced stigma and discrimination compared with supervised daily consumption. However, people also identified concerns regarding their loss of control over their medication, reduced bodily autonomy and agency, isolation due to reduced therapeutic contact and potential adverse side effects.[29–32] LAIB was also shown to be appealing as an alternative to sublingual buprenorphine, with another US study finding that LAIB preparations appealed to more than half of individuals with OUD entering opioid treatment.[33] Real-world evaluations of LAIB with high-risk populations in the USA have also reported positive outcomes with people choosing to continue using LAIB, the majority of individuals (65%) tolerating LAIB well and experiencing no symptoms of precipitated withdrawal or ongoing opioid use.[34]

In another study in people with OUD in France, interest in LAIB relative to other MOUD was related to perceived valued treatment outcomes. Individuals who showed interest in LAIB were more focused on outcomes related to recovery and abstinence, reported more frequent forgetting of their MOUD, or reported negative situations in which taking their MOUD was not practical or appropriate.[35] This was also reflected in a study in Australia where positive perceptions of LAIB were associated with being female, recent illicit drug use and perceived (in) convenience of current OUD treatment.[36] Moreover, a recent qualitative narrative synthesis of LAIB studies (n=15) identified six themes from patient perspectives and patient-reported outcomes. These included LAIB being associated with increased abstinence and reduced cravings, improved accessibility, increased productivity and participation in work, reduced acquisitive crime and improved social relationships. Within the review, it was also identified that misinformation and mistrust were potential barriers to LAIB and that LAIB could negatively affect some social relationships by, for example, removing the daily support of supervised consumption.[37]

Our study concerns Buvidal, which is an LAIB product typically initiated on a weekly basis with subsequent transfer to monthly injections.[24 38] Efficacy has been demonstrated in a double-blind, double-dummy, randomised phase-III-study with 428 individuals, which found Buvidal to be non-inferior to sublingual buprenorphine with regard to primary (opioid use) and secondary (opioid-free urine screening) outcomes.[26] Similar results were obtained in the UK in phase III randomised control trial where LAIB (Sublocade) was clinically superior compared with sublingual buprenorphine and methadone, resulting in increased abstinence from opioids, though it was not cost-effective for the majority of participants. It was however identified as more effective and less costly in participants with longer treatment episodes (>28 days) and those with more severe OUD.[39] A systematic review and meta-analysis conducted in the UK examining efficacy, safety and tolerability data of Buvidal concluded that Buvidal is safe, effective and improves retention compared with sublingual buprenorphine or placebo.[40] In terms of UK individual perspectives on Buvidal, two qualitative studies[31 32] and a service evaluation[9] yielded consistent demand and perceived positive outcomes.

While it is clear that people with OUD perceive initiation of LAIB positively, and if initiated on LAIB report positive experiences,[41] little is known about the actual impacts of Buvidal prescribing on actual patient outcomes in the UK. Person-centred phase III trials of other LAIB products (Sublocade) in the USA have demonstrated significant improvements in self-reported Quality of Life (QoL), increased employment and decreased healthcare utilisation relative to placebo and baseline, though there was no comparison with traditional oral MOUD.[42 43] These positive outcomes are supported elsewhere in the UK, where pilot studies have demonstrated that transition from oral MOUD to LAIB is feasible and acceptable for people with OUD accessing services in South Wales,[44] with qualitative studies reporting positive subjective outcomes in four services in England and Wales.[45]

While there is qualitative evidence that LAIB results in improved outcomes for people with OUD, not all services in England offer LAIB to all eligible clients due to budget

constraints. Between 2013–2014 and 2023–2024, there has been an average reduction of 50% in funding for UK substance use treatment.[46] As a result, some people may be selected for LAIB treatment based on personal, social and individual characteristics (ie, those who are perceived to be a good investment based on whether they are stable), which could increase health inequalities in substance use treatment.[47 48] For example, black people with substance use disorders in the UK may be disproportionately affected by this prioritisation because they are more likely to be living in poverty, unemployed or homeless and may therefore be deemed a less economically efficient option for initiation of LAIB.[49] This remains an issue for service providers despite recent health economic studies in England suggesting that initiation of LAIB results in an overall reduction of direct (delivery, medication, psychosocial treatment) and indirect (eg, criminal justice system, healthcare utilisation) treatment costs.[50] Thus, in addition to investigating if LAIB is associated with improved outcomes, one aim of the present study was to investigate if there are any health inequalities in the initiation of LAIB by understanding individual and demographic predictors (eg, social deprivation, ethnicity, age) of being initiated on LAIB vs other MOUD.

In summary, to date, there has not been a large quantitative evaluation of outcome data for people accessing services in England for OUD and being prescribed LAIB compared with oral MOUD. The objective of this study is to compare outcomes and predictors for people prescribed LAIB versus oral MOUD. To do this we undertook a retrospective analysis of quantitative data from an English substance use treatment provider (Via), analysing sociodemographic characteristics to identify who is most likely to be prescribed LAIB and comparing person-level outcomes for individuals who were prescribed LAIB with a matched control of people on oral MOUD.

METHODS

Design, setting and study population

We conducted a cross-sectional comparison of anonymised electronic records from substance use treatment provider Via. Data from six Via services were included in our analyses. The data controller provided us with routinely collected person-level sociodemographic data, prescribing data, substance use data and physical and mental health assessment scores from the treatment outcome profile (TOP) assessments. During the 12-month period, individuals completed TOPs at every contact with Via which allows comparison of changes in TOPs scores over the time period.

People were eligible to be included in the analysis if they were aged over 18 years, a Via service user in the last 12 months (15 August 2022 and 15 August 2023) and if they were either currently being prescribed LAIB, or if they were a control on another MOUD. Data were extracted for 235 individuals who were currently receiving a LAIB prescription and 266 matched individuals who were receiving another MOUD (total n=501). Matched controls were selected using the following procedure. We were provided with the patient identification and demographic information of 2048 individuals who received oral MOUD. We used gender, ethnicity and primary substance of use as stratifiers to obtain a smaller sample (which reflected the balance of these stratifiers), using the 'stratified' function from the 'splitstackshape' package in R.[51] We aimed for a similar sample size to our LAIB sample, which would still provide us with appropriate statistical power. We then provided the patient identifiers of the stratified sample to Via, who provided us with the TOPs and prescribing data for these individuals. We were unable to request data from all 2048 individuals due to limited resources. Our overall sample size allowed us to detect small effect sizes between the groups on TOP scores (d~0.25) with 80% power and an alpha of 0.05 (independent samples t-test: one-tailed).

We reviewed the medicine scripts to allow us to summarise the most commonly prescribed LAIB and other MOUD dosages. For most individuals, the dose changed over the 1-year period, and for some people in the oral MOUD group, the type of MOUD changed. Based on information on the medicine scripts, the most common dose of LAIB was 64 mg prolonged-release solution (27.8%), followed by 96 mg prolonged-release solution (26.6%) and 128 mg prolonged-release (17.5%). For other MOUD, the most common medication and dose was methadone 1 mg/mL oral solution (52.5%), followed by buprenorphine 2 mg sublingual tablets (19.7%).

Patient and public involvement

DDS is the manager of the Via Innovation and Research Unit and was responsible for coordinating the patient and public involvement of this study. DDS engaged with people with OUD and clinicians in Via services to discuss the planned study. During analysis, DDS involved people with OUD and clinicians in discussions about the qualitative nature of changes in psychological well-being to allow us to accurately contextualise the results for people with lived experience of OUD.

Measures

Prescribing data

Data were extracted from the pharmacy system (Nebula) for each individual over the 1-year period including the start date, end date, dose and name/strength for each prescribed medication.

Sociodemographic information

Routinely collected data including age, sex, indices of multiple deprivation (IMD) decile of patient residence, primary and secondary substance, number of previous treatment episodes, employment status and ethnicity were extracted from the Via's case management system (CMS).

Outcome variables of interest

TOP scores were used to assess changes in substance use, mental and physical health and QoL. The TOP is a standardised tool used in all UK substance use treatment settings to collect routine data at treatment entry and at set time points over the treatment journey (routinely at baseline, every 3 months until treatment exit; 3 and 6 months post treatment exit). The tool is composed of a set of 20 psychometrically valid outcome measures[52] which have been shown to have good inter-rater reliability and test-retest reliability.[53] We used the routinely collected TOPs data to assess substance use (number of days using opiates/opioids in the last month; number of days injecting in the last month), psychological health, physical health and QoL (visual analogue scale from 0=poor to 20=good), number of days in paid employment in the last month and number of days in education in the last month.

Our TOPs analysis was limited to data collected between 15 August 2022 and 15 August 2023. As it was possible to have multiple TOP assessments in this period, we created two different outcome variables based on the TOP scores. If multiple assessments were taken during the 1-year period (n=383), we calculated a TOPs change score (the difference between the first and last assessment) to examine any change in TOPs scores during the time period. Second, we created a summary TOPs score for each outcome during the assessment period (the average for each TOP variable if multiple assessments were taken). Using this method, we analysed only psychological health, physical health and QoL TOPs scores. Analyses for the summary TOPs score are reported in online supplemental table 1 and figure 1.

We could not calculate change scores or summary scores for the TOP substance use and employment variables (opioid use, intravenous drug use and paid work in the last 28 days) as they were largely 0 counts. For these variables, we created a binary variable to identify whether any opioid use, intravenous drug use or paid employment was reported.

Procedure

After gaining institutional ethical approval, a Data Sharing Agreement was established between Liverpool John Moores University (LJMU) and Via. In Phase 1, pseudonymised demographic data for people receiving LAIB and oral MOUD was downloaded from Via's CMS and uploaded to a secure shared folder on CM's university file store. In Phase 2, full prescribing and outcome data for all individuals prescribed LAIB, and the selected controls were downloaded from Via's CMS into a Microsoft Excel file and uploaded to a secure folder on CM's file store and shared with the research team for analysis (CM and AJ).

Data analysis

To examine predictors of receiving LAIB compared with oral MOUD, we conducted a logistic regression. We included available demographic information. Despite stratifying based on sex, ethnicity and primary substance we included these in the regression to hold them constant. For the logistic models, we report ORs and 95% CIs as parameter estimates.

Psychological health, physical health and QoL scores were analysed using Welch's t-tests. In adjusted models, we conducted linear regressions including the demographic predictors (age, employment, ethnicity, age of first substance, number of episodes, sex and IMD) to predict the TOPs change scores for psychological health, physical health and QoL (comparable analyses for summary scores can be found in online supplemental file 1). There were some missing data for IMD (n=34/6.7%) and age of first use (n=20/4.0%). Missing data for IMD was likely reflective of people with no fixed abode (eg, those experiencing street homelessness) and therefore was not missing at random. As such we did not conduct multiple imputation analyses as this may serve to increase possible bias.[54] However, we conduct all adjusted analyses with these variables removed as sensitivity analyses, and any deviation from adjusted analyses with these variables included is noted. For opioid use and intravenous drug use, we conducted logistic regressions in which any amount of opioid use or intravenous drug use recorded was coded as 1.

Data and analysis code for the study can be found here: (dataset) https://opendata.ljmu.ac.uk/id/eprint/182

RESULTS

Baseline characteristics of participants

The baseline characteristics of individuals can be found in table 1. Of the 235 individuals receiving LAIB, 60 (25.5%) were female, 185 (78.7%) identified as white ethnicity, with the majority (186 clients – 79.1%) reporting illicit heroin as their primary substance. Of the 266 individuals receiving MOUD, 67 (25.2%) were female, 187 (70.3%) identified as white ethnicity, with the majority (220 clients – 82.7%) reporting illicit heroin as their primary substance. There were significant differences between the groups in current age ($t(498.6)=4.81$, $p<0.001$, $d=0.43$ (95% CI 0.25 to 0.61)), number of previous treatment episodes ($t(463.6)=3.40$, $p<0.001$, $d=0.31$ (95% CI 0.13 to 0.48)) and regular employment ($X^2(1) = 6.27$, $p=0.012$) with individuals who were receiving LAIB being significantly younger, having more previous treatment episodes and having higher levels of regular employment.

Predictors of LAIB prescribing

We included eight variables in the logistic regression model to examine whether any predicted the increased/decreased odds of being prescribed LAIB. These variables were; current age, employment (currently employed vs not), ethnicity (white vs other), age of first substance, number of episodes, client sex at registration of birth (sex: male vs female), IMD, and primary substance (illicit heroin pared to other substances). See table 2 for

Table 1 Demographic breakdown of individuals prescribed LAIB versus compared with oral MOUD. Total n=501

	LAIB	Other
	Mean (SD)	Mean (SD)
Current age	**43.17 (9.00)**	**47.23 (9.89)**
Age of first substance	22.44 (6.93)	23.36 (9.10)
Number of episodes	**1.86 (1.21)**	**1.52 (1.04)**
IMD	4.43 (2.53)	4.54 (2.35)
	N (%)	N (%)
Ethnicity		
White	185 (78.7)	213 (80.4)
Asian/British Asian	27 (11.5)	22 (8.3)
Black/black British/African	13 (5.5)	7 (2.6)
Mixed/multiple	3 (1.3)	9 (3.4)
Unknown/other	7 (3.0)	14 (5.3)
Employment		
Regular employment	**55 (23.4)**	**38 (14.3)**
Other	**180 (76.6)**	**228 (85.7)**
Sex		
Female	60 (25.5)	67 (25.2)
Male	175 (74.5)	199 (74.8)
Primary substance		
Illicit heroin	186 (79.1)	220 (82.7)
Other	49 (20.9)	46 (17.3)
Secondary substance		
Cocaine (crack)	122 (51.9)	120 (45.1)
No second substance	56 (23.8)	78 (29.3)
Other	57 (24.3)	68 (25.6)

Variables with categorical response are simplified due to large number of categories with small numbers of individuals within some categories. Reference categories were chosen based on the largest number (eg, white, illicit heroin). In the case of the employment variable, regular employment was not the most common category, but the 'other' comparison represents a lot of similar categories (eg, 'retired', 'unemployed', 'homemaker). IMD was also missing from 34 individuals due to having no fixed address or this not information being available. Variables in bold indicate a significant difference between the groups (LAIB compared with oral MOUD).
IMD, Indices of Multiple Deprivation; LAIB, long-acting injectable buprenorphine; MOUD, medications for opioid use disorder.

model parameters. The overall model was able to predict around 7% of variance in the outcome. Individuals of a younger age, who were regularly employed, and had an increased number of episodes, had increased odds of being prescribed LAIB (compared with other MOUD).

Difference in TOPs scores

For psychological health and physical health, there was no significant difference between individuals who were and were not prescribed LAIB t(390.96)=1.57, p=0.12, d=−0.16; t(385.04)=0.64, p=0.52, d=0.06 respectively. For QoL, there was a significant difference, in that individuals who were prescribed LAIB reported a positive change in QoL compared with other treatments t(381.57)=2.21, p=0.03, d=0.22; mean improvement LAIB=1.40, mean improvement other=0.52 (figure 1).

Table 2 Logistic regression analysis examining predictors of being prescribed LAIB (compared with oral MOUD)

	LAIB (compared with oral MOUD)		
Predictors	ORs	CI	P value
Current age	**0.96**	**0.94 to 0.98**	**<0.001**
Employment (regular employment)	**1.89**	**1.13 to 3.19**	**0.016**
Ethnicity (white British)	0.93	0.57 to 1.51	0.755
Age of first substance	1.00	0.98 to 1.03	0.880
Number of episodes	**1.38**	**1.15 to 1.68**	**0.001**
Sex (male)	1.00	0.62 to 1.57	0.964
Primary substance (other)	1.02	0.61 to 1.71	0.929
IMD	0.97	0.89 to 1.05	0.461
R^2 (pseudo)	0.079		

Bold values highlight statistically significant difference.
IMD, Indices of Multiple Deprivation; LAIB, long-acting injectable buprenorphine; MOUD, medications for opioid use disorder.

In adjusted models, there were no significant predictors of change in psychological health (R^2=0.00), physical health (R^2=0.00) or QoL (R^2=0.02), though there was a trend for current age being negatively related to psychological health and IMD decile positively related to physical health. In adjusted models, LAIB was a marginally non-significant predictor of QoL (p=0.051) (see table 3). In models with IMD and age of first use removed, LAIB remained a non-significant predictor in all models; however, being of white ethnicity was associated with an improved QoL (B=−1.00 (95% CI −2.00 to −0.01), = 0.048) and physical health (B=−1.11 (95% CI −2.14 to −0.07), p=0.036). Age was a significant predictor of psychological health (B=−0.05 (95% CI −0.010 to −0.01), p=0.019).

TOPs substance use variables

There were 151 instances in which no opioid use was reported and 252 instances in which opioid use was reported. The odds of decreased opioid use were not statistically significantly associated with LAIB (OR=0.81 (95 CI 0.54 to 1.23), p=0.325). In adjusted models, the number of episodes was a significant positive predictor of increased opioid use (OR=1.40 (95% CI 1.08 to 1.87), p=0.016).

There were 355 instances in which no intravenous drug use was reported and 38 instances in which it was. The odds of decreased intravenous use were not statistically significantly associated with LAIB (OR=1.27 (95% CI 0.65 to 2.52), p=0.485). Due to the small number of instances, an adjusted model was not possible.

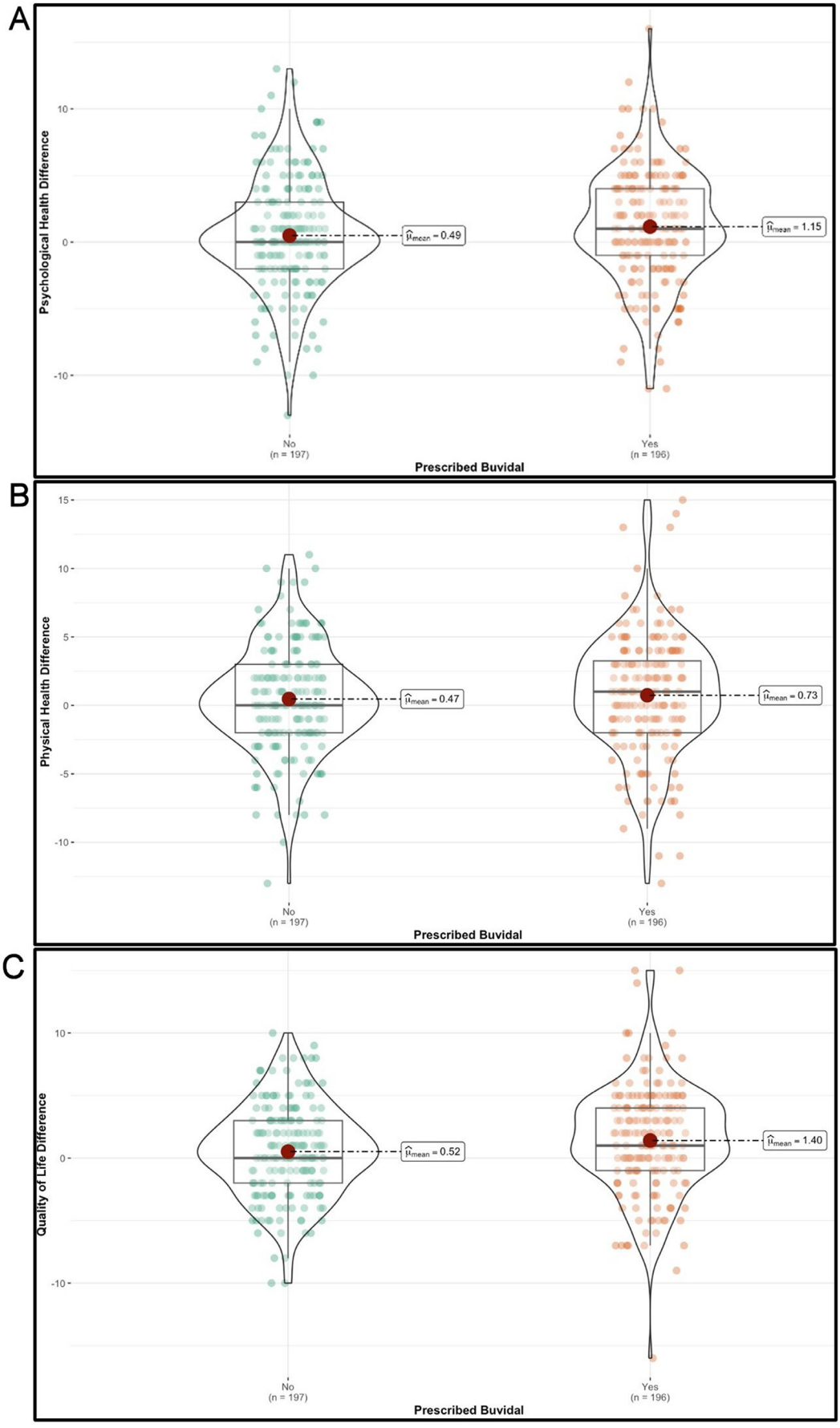

Figure 1 Changes in psychological health (A), physical health (B) and Quality of Life (C) in long-acting injectable buprenorphine compared with oral medications for opioid use disorder.

Table 3 Adjusted regression models for the effects of LAIB versus other MOUD on TOP outcomes

	Psychological health		Physical health		Quality of life	
Predictors	Estimates (CI)	P value	Estimates (CI)	P value	Estimates (CI)	P value
Medication [other MOUD]	0.62 (–0.30 to 1.55)	0.185	0.31 (–0.60 to 1.23)	0.5	0.88 (–0.00 to 1.75)	0.051
Current age	–0.04 (–0.09 to 0.01)	0.092	–0.01 (–0.06 to 0.04)	0.642	–0.03 (–0.08 to 0.01)	0.168
Employment [regular employment]	0.15 (–0.99 to 1.28)	0.799	–0.25 (–1.38 to 0.87)	0.661	–0.55 (–1.63 to 0.52)	0.313
Ethnicity [non-white]	–0.02 (–1.14 to 1.10)	0.97	–0.83 (–1.94 to 0.28)	0.141	–0.91 (–1.97 to 0.15)	0.094
Age of first substance	0.01 (–0.05 to 0.07)	0.718	0.02 (–0.04 to 0.07)	0.515	0.03 (–0.03 to 0.08)	0.359
Number of episodes	–0.11 (–0.56 to 0.33)	0.608	–0.02 (–0.45 to 0.42)	0.946	0.01 (–0.41 to 0.43)	0.953
Sex [female]	0.14 (–0.91 to 1.19)	0.79	–0.13 (–1.18 to 0.92)	0.806	0.06 (–0.94 to 1.06)	0.903
IMD	0 (–0.19 to 0.19)	0.997	0.17 (–0.02 to 0.35)	0.076	0.09 (–0.09 to 0.27)	0.314
Observations	354		354		354	
R^2/R^2 adjusted	0.019/0.00		0.016/0.00		0.043/0.021	

Reference categories stated in [].
IMD, Indices of Multiple Deprivation; LAIB, long-acting injectable buprenorphine; MOUD, medications for opioid use disorder; TOP, treatment outcome profile.

DISCUSSION

In this study, we compared TOPs outcomes for individuals prescribed LAIB versus oral MOUD. While previous research has examined the retention and efficacy of LAIB for treating OUD, there is comparatively little investigation of outcomes relating to individuals. This is one of the first large investigations of person-rated outcomes and demographic factors in people prescribed LAIB versus oral MOUD. In our analyses, people who were prescribed LAIB were younger, more likely to be employed, and had more previous treatment episodes. LAIB was associated with positive changes in QoL over the treatment period. Supplementary analyses (see online supplemental file 1) highlighted that overall people prescribed LAIB reported higher levels of psychological and physical health, and QoL compared with people receiving MOUD. Other demographic and situational factors were positive and negative predictors in these analyses indicating the intersectional nature of changes in health during recovery.

The findings in this study reflect those in previous research. For example, when considering factors associated with LAIB prescribing, an evaluation of LAIB in West Lothian found that LAIB helped people consider employment, which is supported by higher employment in LAIB clients in the present study,[55] although we did not find associations with sex as reported in previous research.[36] We were particularly interested in predictors of LAIB initiation in the present study as budget constraints in UK treatment services could increase health inequalities.[47 48] While we did not find evidence for inequalities in initiation of LAIB related to social deprivation (IMD), sex or ethnicity, we did find evidence that those who are younger, have more treatment episodes and are in regular employment are more likely to receive LAIB. This provides some tentative evidence that certain individual factors are associated with an increased likelihood of receiving LAIB relative to oral MOUD. The finding for age is more concerning in terms of inequality as ageing populations of substance users are subject to greater levels of substance-related harms[56] but have been shown to achieve better treatment outcomes than their younger counterparts[57] and may also benefit from LAIB. In the present study, we also identified that age was a significant negative predator of psychological health, indicating that older people may have unmet mental health needs and would benefit from LAIB initiation. However, one alternative explanation is that older people with OUD are reluctant to switch from methadone, a known entity, to novel treatments. Substance treatment guidance in the UK suggests that people with longer OUD history (ie, older individuals) or those with heightened withdrawal-related anxiety may prefer methadone to buprenorphine because of the sedative effect.[58] Thus, we cannot say if older adults were not selected for, or declined, LAIB. Future research should seek to supplement the quantitative analyses with qualitative data to understand clinicians and people with OUD's choice of treatment.

In our analyses of changes in self-reported outcomes over the 1-year period, LAIB was a significant predictor of changes in QoL, but not physical or mental health. In previous qualitative studies on the acceptability of LAIB in people with OUD, one key theme that emerged was the perception that LAIB would allow individuals to get on with everyday life.[32] Indeed, analysis of person-level outcome measures found that people on LAIB reported increased life satisfaction and improved self-care (specifically taking up sports and hobbies and improvements in mental health). Interestingly, 43% of individuals reported improved material resources such as employment while 86% (12 people) reported improved well-being[45] which is reflective of LAIB's association with increased employment and QoL in the present study. However, previous

studies in people using MOUD and sublingual buprenorphine (eg, [57]) have noted that initial improvements in QoL are not sustained over longer-term outcomes. Thus, further long-term analysis of the LAIB data is needed to assess if changes in QoL are sustained and if they are meaningful indicators of recovery. The inclusion of demographic predictors in the adjusted models reduced LAIB to just below statistical significance, indicating the intersectional nature of changes in QoL over the 1-year period. For example, in this analysis, we identified that being of white ethnicity was associated with improved QoL and physical health, which indicates the role of ethnicity in treatment outcomes.[47–49]

Supplementary analyses of summary TOPs scores indicated that psychological and physical health and QoL were positively predicted by LAIB, employment and being male. For physical health age was a negative predictor in the model (older people had worse physical health), while for QoL age of initiation was a positive predictor (people who started using later reported better QoL). Taken together, these results could reflect the concomitant effects of age (or indeed longer-term substance use) on well-being and long-term conditions (see [57] for review). Finally, a number of treatment episodes was a negative predictor of QoL indicating that more treatment episodes were associated with lower QoL. These analyses highlight some important individual characteristics related to treatment outcomes. For example, poorer self-reported outcomes for females compared with males are not in line with previous research (eg, a study by Larance *et al*[36]) and warrants further investigation.

This study had a number of limitations. First, this was a time-limited study and we were only able to access data for a 1-year period within the scope of our funding. Thus, we were not able to fully investigate the associations between LAIB and treatment outcomes in terms of QoL, physical/mental health and employment beyond the treatment journey, and conversely relapse. There was insufficient data available to investigate individuals who were discharged from the treatment service during this time, and due to the cross-sectional nature, we could not include treatment duration in our analyses. Future research should investigate outcomes and treatment trajectories over a longer-time period taking in to account previous treatment episodes, durations and outcomes. We also believe that further studies should also look at societal impact outcomes, such as the number of healthcare (eg, General practitioner/primary care physician, Accident and Emergency/Emergency Room) and police attendances, and employment status, which we could not evaluate within the scope of the present study. Due to the limited capacity to link all prescribing data within the Pharmacy team in Via, we statistically stratified our oral MOUD comparison group and selected 266 controls on oral MOUD. While we do not believe that these clients would have differed from the 1783 individuals on oral MOUD who were not selected, it remains a possibility that this sample differed in some way from the selected control group. While we found significant improvements in QoL, and significant differences between the people prescribed LAIB in physical and mental health and QoL, the TOPs scales are visual analogue assessment scales, and there is no indication as to how or why individuals feel these indicators have changed on LAIB. Follow-up qualitative analyses would allow for the characterisation of these indices during recovery.

To our knowledge, this is the first large study to compare self-reported outcomes for individuals prescribed LAIB compared with oral MOUD. People initiated on LAIB were younger, more likely to be employed, had more previous treatment episodes, and relative to the people on oral MOUD, had significant improvements in QoL over the 1-year period. Future research should seek to investigate the aetiology of improved well-being using qualitative analysis and should perform a quantitative analysis of outcomes over a longer period to investigate the impacts of LAIB and intersectional characteristics on recovery outcomes.

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Acknowledgements We would like to thank Petra Harris, Head of Data and Performance at Via for extracting and curating the raw data, and Via Clinical Analyst Kelly Smith. We would also like to thank all of the staff, service users, pharmacy partners and commissioners who work for/with Via.

Contributors CM and YA designed the study with input from AJ, M-CVH and DDS. CM, YA and DDS applied for funding to support the study. RG coordinated the curation of the raw prescribing data. AJ performed the statistical analysis including data curation, analysis, analytical strategy, reporting and drafting the results section. M-CVH performed a critical review of the literature. DDS liaised with people with opioid dependence and clinicians to discuss the study and contextualise the results. CM produced the first draft of the manuscript and all authors have provided critical revisions and approved the final manuscript. CM is the guarantor.

Funding This research was funded by a research grant awarded by Camurus to YA and CM, grant number UK-NPR-2300062.

Competing interests This study was funded by Camurus AB. The funder had no role in the design, planning, execution or analyses in this study. CM and M-CVH also receive funding from CSL Seqirus. YA has received an honorarium from Camurus, Newbridge Pharma and Ethypharm. AJ, RG and DDS report no conflict of interest.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Not applicable.

Ethics approval This was a retrospective data analysis of anonymised health records and was approved as a minimal risk by Liverpool John Moores University Research Ethics Committee (LJMUREC 23/PSY/036). This was a retrospective outcomes analysis of anonymised electronic health records, therefore consent was not obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available in a public, open access repository. The data and analysis code for this study is available in the Liverpool John Moores University Data Repository: https://opendata.ljmu.ac.uk/id/eprint/182. The information is publicly available and accessible upon request.

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