

QUEENSLAND TREASURY

Factors associated with the outcomes of community-based corrections orders

Summary report

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**Queensland Government Statistician's Office**

Queensland Treasury

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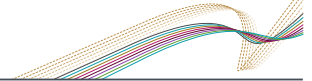
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1.0 Introduction

This summary report presents the key findings of the *Factors associated with the outcomes of community-based corrections orders* (order outcomes) research project. The research aimed to examine the:

- characteristics and outcomes of community-based corrections orders served by adults; and
- factors associated with the completion of community-based corrections orders served by adults.

The research shows that while there was variability in order completion across the different types of orders, overall, most orders were completed and there have been slight increases in order completion rates in recent years. These increases may be explained by changes in the types of people under supervision and the movement towards a more therapeutic approach to order administration. The research highlights the complex interplay of factors that can influence order outcomes and many of the results collected as part of the project are consistent with the findings outlined in the *Queensland Parole System Review* and other studies.¹

2.0 Methods

The order outcomes research project used a mixed methods approach to explore the characteristics and outcomes of community-based corrections orders. Qualitative research strategies involved discussions with a sample of community corrections officers via focus group sessions or in-depth interviews.² Analysis of qualitative data was conducted to identify emergent and reoccurring themes in relation to the project's research objectives and prior research. Quantitative strategies involved the analysis of Queensland Corrective Services (QCS) administrative data relating to in-scope orders served by adults, *commencing* between 2010–11 and 2016–17.³ In-scope orders are supervision orders (probation and intensive correction) and reparation-type orders (community service, fine option and graffiti removal). See Appendix section 1.1 for further information on in-scope orders.

Descriptive statistics and binomial logistic regression techniques were used to analyse quantitative data. The data presented in this summary report are subject to limitations that should be considered in the interpretation of findings. See Appendix section 1.2 for further information regarding these limitations.

3.0 Results

This section presents information on the number and types of orders commenced between 2010–11 and 2016–17, profiles the characteristics of people serving these orders, and reports on order completion rates. This is followed by the presentation of factors considered and shown to be associated with order completion. Considered factors are those suggested by research participants and shown factors are those identified through statistical analysis of QCS administrative data.

3.1. Profile of orders

The number and types of community-based corrections orders changed during the observation period. In particular, there was a substantial increase in the number of probation orders, the most common type of order under supervision (see Figure 1). When comparing 2016–17 with 2010–11:

- probation orders increased by 22.6%, from 8,262 to 10,129
- community service orders increased by 5.8%, from 3,514 to 3,717
- intensive correction orders declined by 29.4%, from 428 to 302
- fine option orders declined by 50.2%, from 1,765 to 878.

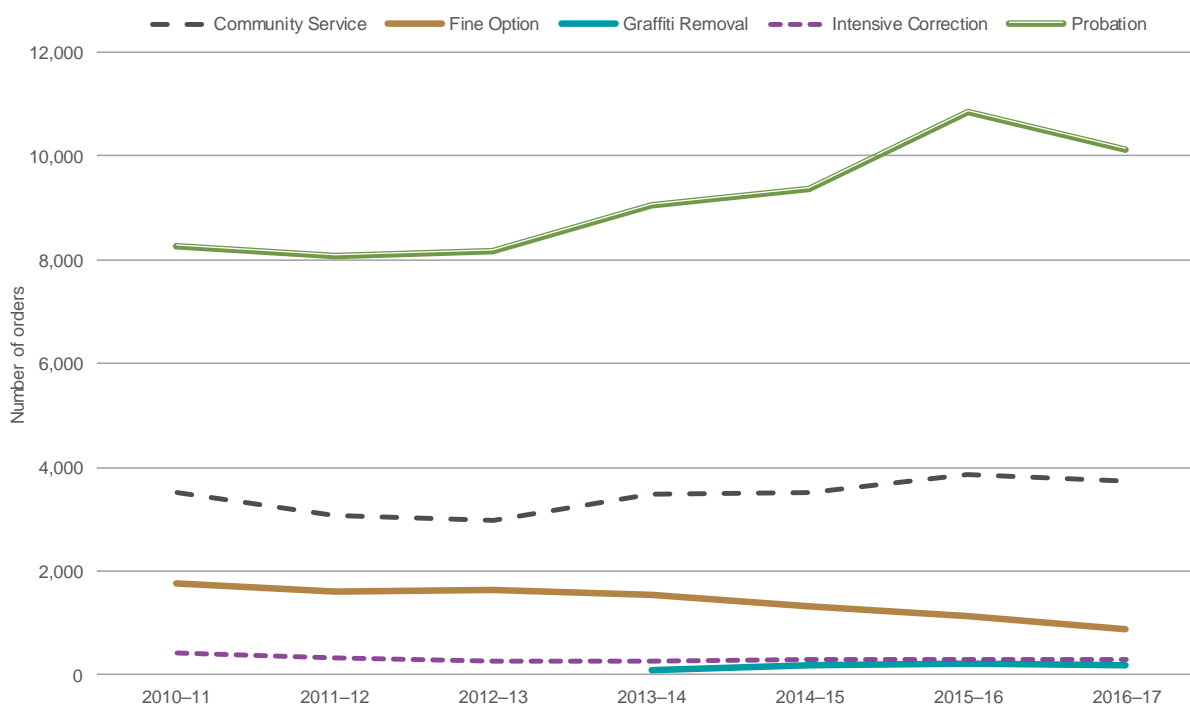
While the number of probation orders increased over time, their average length decreased to 382 days in 2016–17 compared with 437 days in 2010–11.

¹ Queensland Government 2016, *Queensland parole system review: Final report*, <<https://parolereview.premiers.qld.gov.au/assets/queensland-parole-system-review-final-report.pdf>>.

² The views expressed by these research participants do not necessarily reflect the views of all community corrections officers, Queensland Corrective Services as an organisation, or the Queensland Government.

³ This data series was selected to ensure reliable information and the transpiration of enough time to examine order outcomes.

Figure 1 Selected orders commenced, by order type



3.2. Profile of people serving orders

The demographic profile and prevalence of presenting needs among people serving orders also changed during the observation period. Presenting needs include those often found to be associated with offending behaviour such as substance misuse and unemployment.

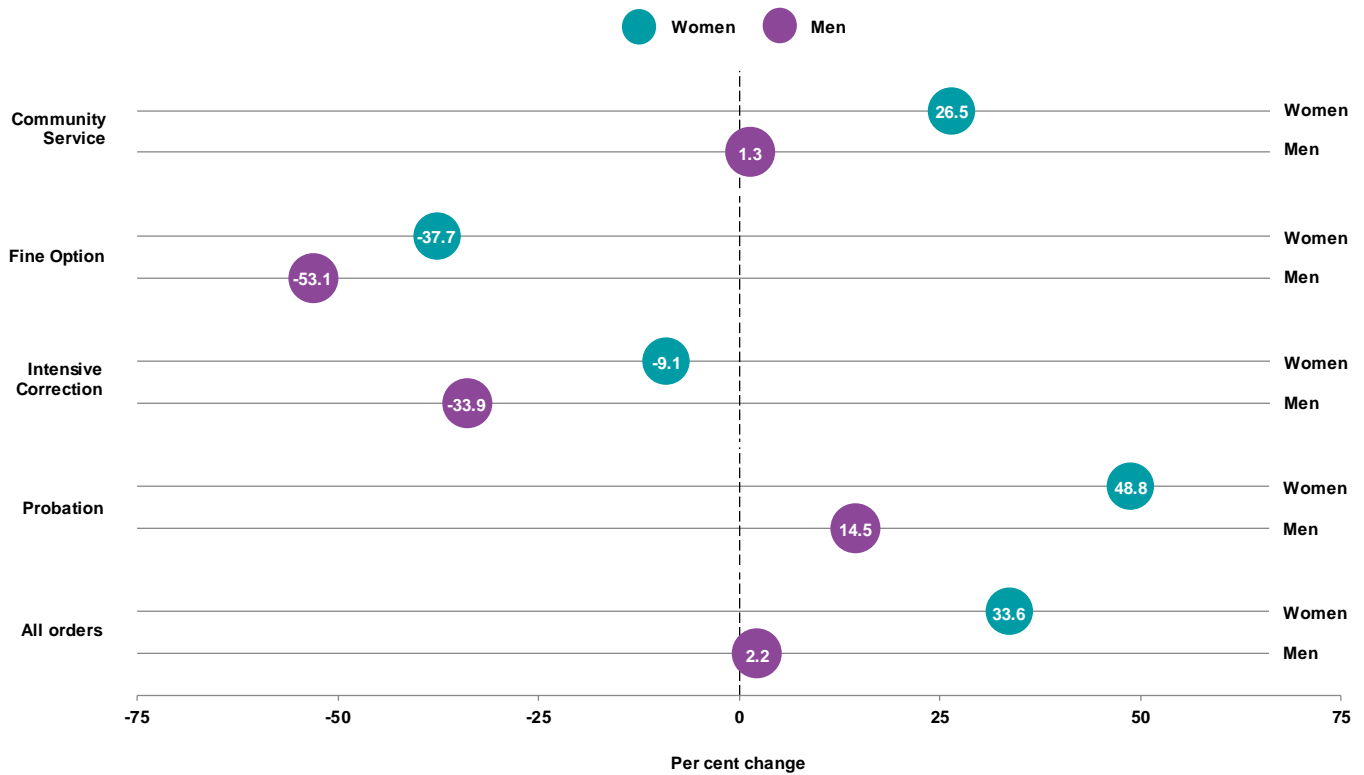
3.2.1. Gender

While most community-based orders were served by men (76.6%), growth in the number of community-based orders over the observation period was generally higher for those served by women (see Figure 2). For example, the number of probation orders served by women increased by 48.8% when comparing 2016-17 with 2010-11, while there was a 14.5% increase for probation orders served by men. Over the same period, community service orders being served by women increased by 26.5%, while a 1.3% increase was recorded for men.

3.2.2. Age

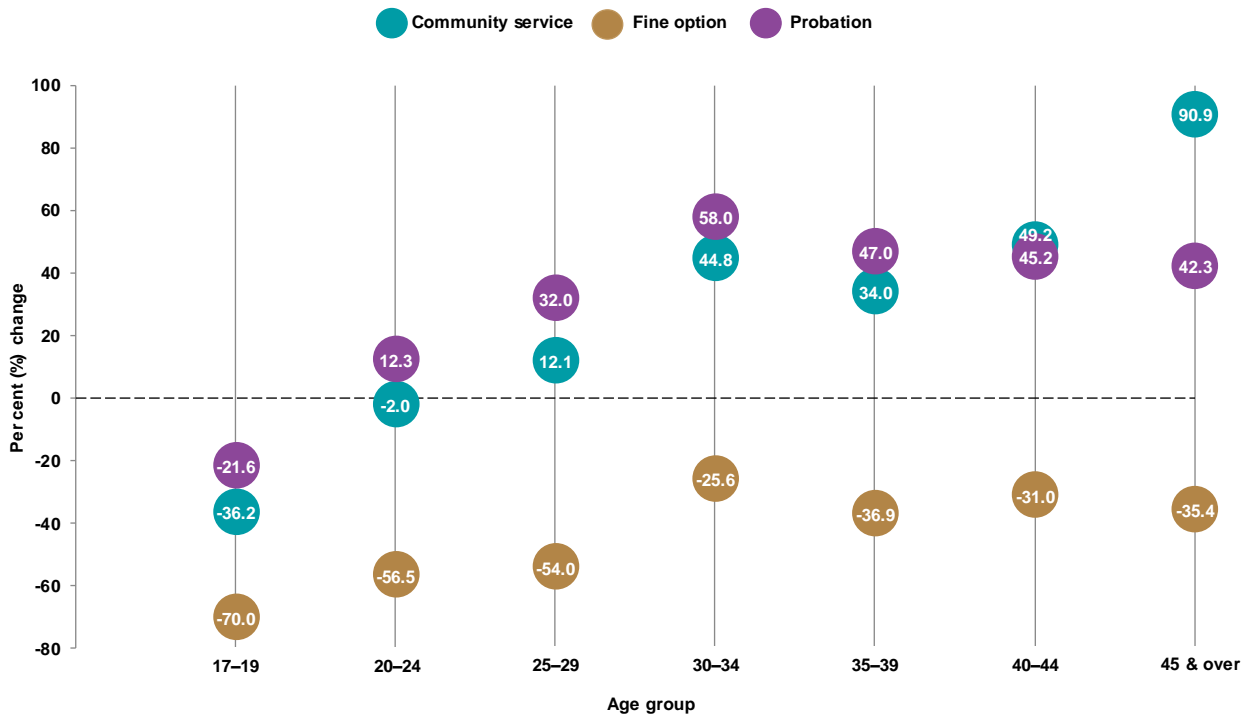
While those aged 17-24 years accounted for the largest share of community-based orders (42.1%) between 2010-11 and 2016-17, there was evidence to suggest a decline in the number of young adults serving community-based orders in recent years (see Figure 3). For example, the number of community service orders served by those aged 17-19 years and 20-24 years decreased by 36.2% and 2.0% respectively in 2016-17 compared with 2010-11, while increasing for all older age groups. Similarly, the number of probation orders served by 17-19 year olds decreased by 21.8%, but increased for all older age groups. Analysis of publicly available crime and justice data suggests that the decline in young adults serving community-based orders is unlikely to reflect an increased probability of their being sentenced to a term of imprisonment.

Figure 2 Percentage change in number of orders served, by gender, from 2010–11 to 2016–17



Note:
Graffiti removal orders were not included as they were introduced in Queensland in 2013–14.

Figure 3 Percentage change in number of orders served, by age group, from 2010–11 to 2016–17

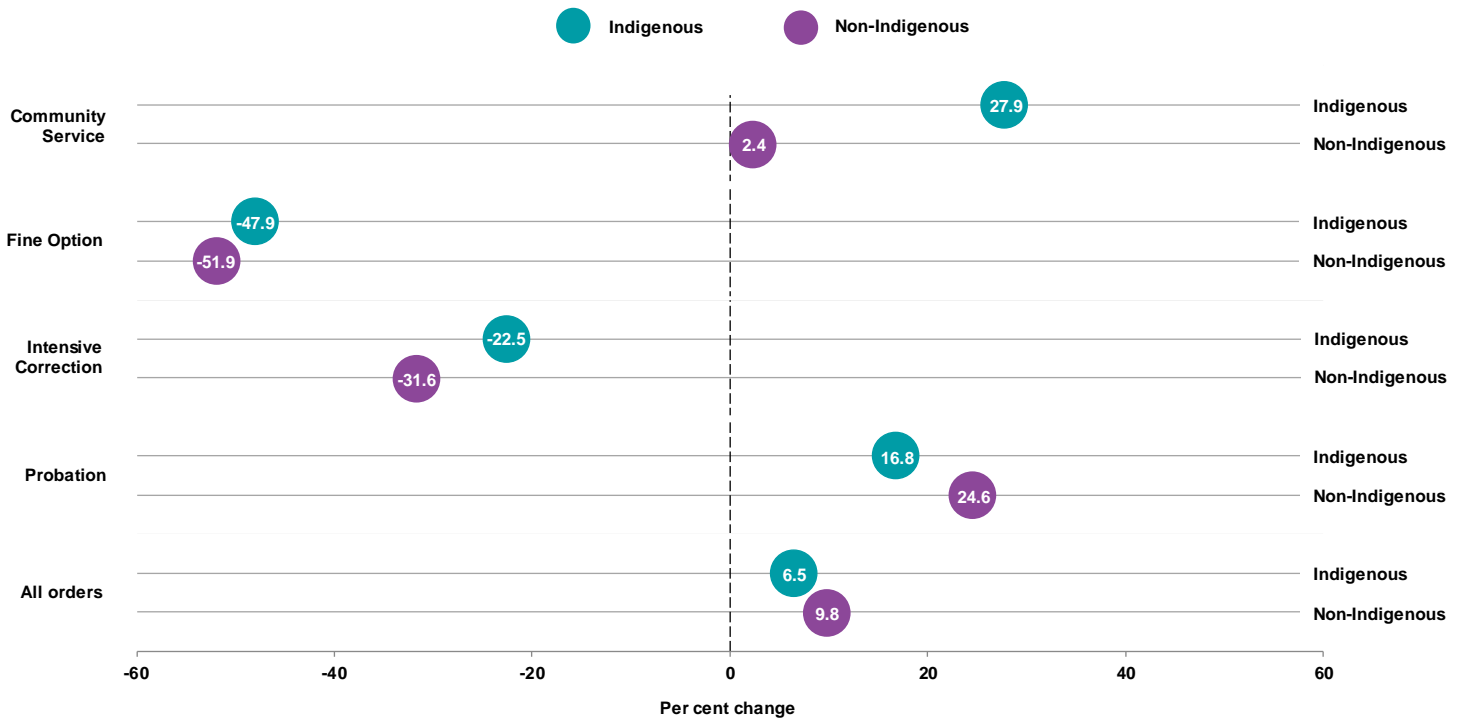


Note:
Graffiti removal orders were not included in this figure as they were introduced in Queensland in 2013–14. Intensive correction orders were excluded due to the small number of orders in certain age categories.

3.2.3. Indigenous status

Aboriginal and Torres Strait Islander individuals accounted for 27.7% of people serving orders commenced between 2010–11 and 2016–17. Similar trends occurred in relation to changes in the number of orders served and Indigenous status, however the magnitude of change was different (Figure 4). For example, when comparing 2016–17 with 2010–11, the number of probation orders served by Aboriginal and Torres Strait Islander people increased by 16.8%, while the number served by non-Indigenous people increased by 24.6%. Decreases in the number of intensive corrections orders among those served by Aboriginal and Torres Strait Islander people (22.5%) were smaller than those occurring for non-Indigenous individuals (31.6%).

Figure 4 Percentage change in number of orders served, by Indigenous status, from 2010–11 to 2016–17



Note:

Graffiti removal orders were not included in this figure as they were only introduced in Queensland in 2013–14.

3.2.4. Presenting needs

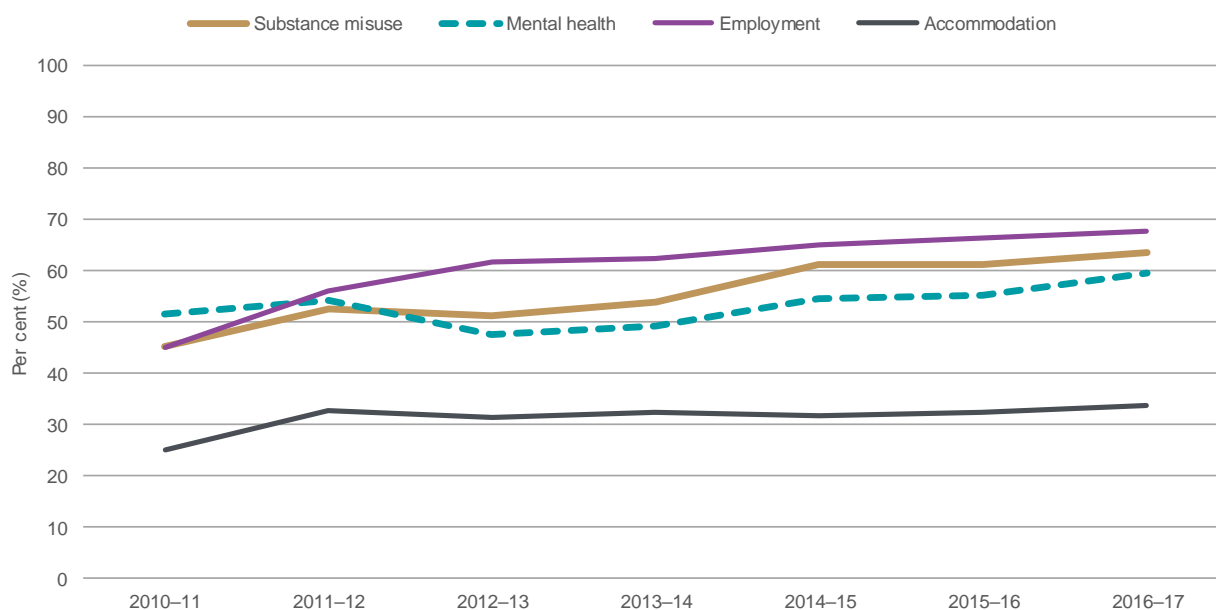
There is evidence to suggest increasing complexity in terms of presenting needs among individuals serving community-based corrections orders (Figure 5). Analysis of available assessment information relating to people serving probation and intensive corrections orders showed that, when comparing 2016–17 with 2010–11 results:

- the proportion of individuals assessed as presenting with a high substance misuse need rose to 63.4% from 45.1%
- the proportion assessed as having a high employment need rose to 67.8% from 45.1%
- the proportion assessed as having a high accommodation need rose to 33.7% from 25.1%
- the proportion presenting with a mental health issue increased to 59.5% from 51.4%.⁴

Research participants commonly referred to perceived increases in illicit drug use and mental health issues among those serving orders. They also commented on the importance of having stable accommodation when trying to address some of the complex issues associated with involvement in crime.

⁴ These results use information collected via the *benchmark assessment*. This tool is used by QCS to facilitate the management of individuals serving certain types of orders and the identification of a presenting need does not necessarily denote a clinical assessment of this need. See Appendix 1.2 for further information regarding the limitations associated with using information collected via the benchmark assessment tool and Appendix 1.3 for information on assessment criterion.

Figure 5 Proportion of probation and intensive correction orders served by persons assessed as high need for selected issues



Notes:

1. The criterion used to assess substance misuse includes questions on patterns of substance use and the impact of this use; mental health assessment consists of questions on mental health history (ever and recent) and use of prescribed medical treatment; the criterion used to assess accommodation includes questions on current living arrangements and stability of living arrangements in the preceding 12 months; the employment assessment consists of questions relating to an individual's current employment status, longest period of employment, and whether they were employed for greater than 50% of the past year.
2. Individuals without benchmark assessment information were excluded from analysis.

3.3. Order completion rates

Most community-based orders were completed, with around 73.5% of all in-scope orders commenced between 2010–11 and 2016–17 finalised.⁵ Overall, there have been slight improvements in completion rates in recent years and reparation-type orders tended to have slightly lower completion rates than other types of orders (Figure 6). The completion rates of community-based orders in 2016–17 compared with 2010–11 were:

- probation (79.3% from 75.6%)
- community service (65.9% from 65.5%)
- intensive correction (74.5% from 72.2%)
- fine option (60.0% from 62.6%)
- graffiti removal (76.9% in 2016–17 from 84.6% in 2013–14).

Examination of all orders over the observation period revealed that community-based orders served by women were completed at slightly higher rates than those completed by men (76.0% and 72.7% respectively). Order completion rates for all orders served by men increased to 73.7% in 2016–17 compared with 70.7% in 2010–11, while the completion rates for all women increased to 78.0% compared with 73.5% over the same period.

Older individuals were more likely to complete community-based orders than younger persons. However, improvements in order completion rates between 2010–11 and 2016–17 were far more likely to be recorded for those orders served by individuals aged 17– 24 years than those aged 25 years or older. This finding coincides with a decreasing number of young people on community-based orders in recent years referred to above.

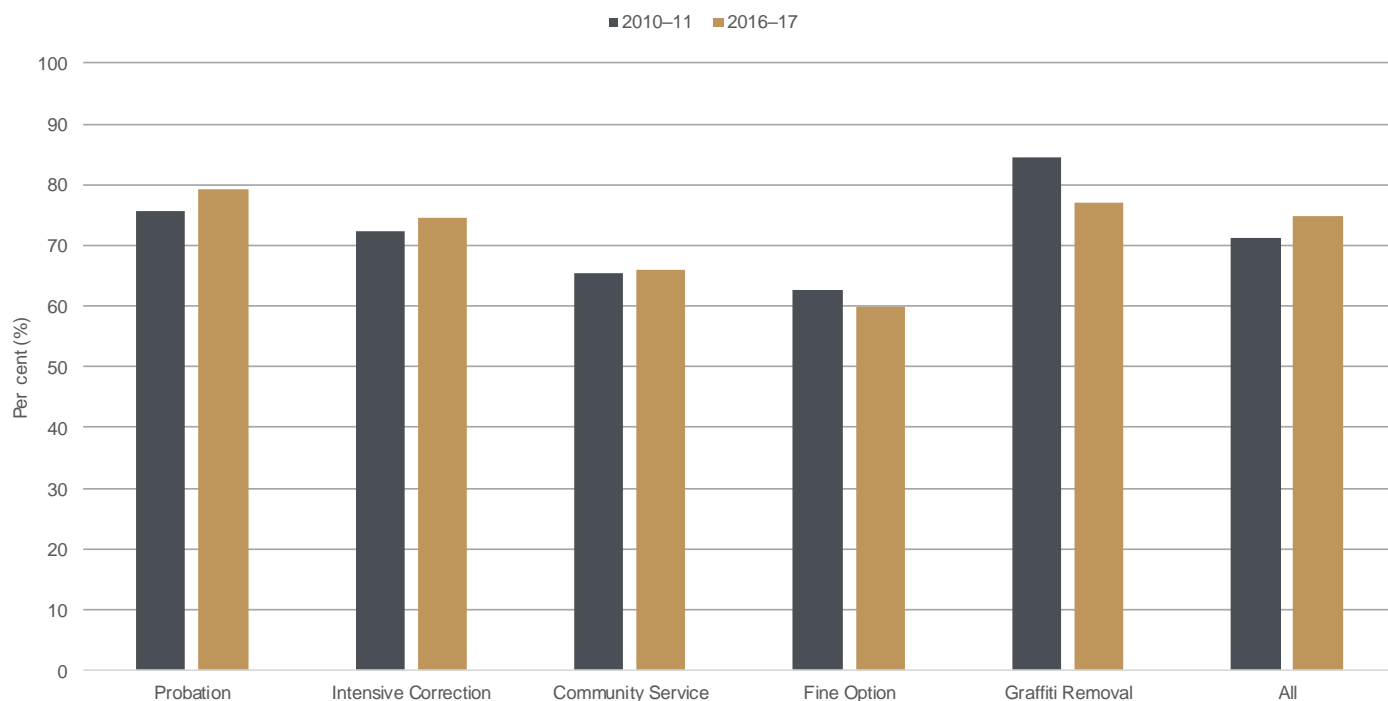
The completion of orders among non-Indigenous individuals was higher than that for Aboriginal and Torres Strait Islander individuals. However, the proportion of orders served by Aboriginal and Torres Strait Islander people being completed

⁵ Completed orders are those that have not been revoked, terminated or cancelled by the court. An order can be deemed completed despite being contravened through an action by the person serving the order. An order may be contravened without being cancelled by the court.



grew to 68.0% in 2016–17 compared with 61.1% in 2010–11. This increase was larger than for orders served by non-Indigenous individuals, which experienced a slight increase in completion (77.4% in 2016–17 compared with 75.3% in 2010–11).

Figure 6 Order completion rates for selected orders, 2010–11 compared with 2016–17^(a)



(a) Completion rates for graffiti removal compare 2013–14 with 2016–17, as this order type was only introduced in 2013–14.

3.4. Factors impacting order completion

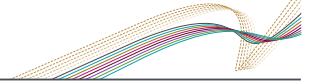
The order outcomes research project explored factors impacting order completion using qualitative and quantitative research strategies. This section describes the results of modelling work undertaken using QCS administrative data and discusses the factors considered to facilitate or impede order completion identified by community corrections officers participating in the research. See Appendix sections 1.3 and 1.5 for further information on model development and limitations.

The model was constructed using binomial logistic regression to explore if the relationships found using descriptive statistics held true once multiple factors were controlled for. That is, the logistic regression model enabled the exploration of multiple explanatory variables concurrently and their effect on order outcomes.

The results of the modelling work are expressed as odds ratios. Odds ratios are a simple way of providing context to the results of a model and can be defined as the comparison between the odds of an event occurring in one group to the odds of the same event occurring in another group. For example, results show an order served by an individual aged 40–44 years has odds of being completed 1.47 times (or 46.9%) higher than one being served by an individual aged 17–19 years. It can therefore be said that orders served by those aged 40–44 years have higher odds of being completed than orders served by those aged 17–19 years.

Figure 7 shows that orders served by:

- men were at 8.9% lower odds of being completed than those served by women
- people aged 45 years and over were at 82.7% higher odds of being completed than orders served by people aged 17–19 years
- Aboriginal and Torres Strait Islander persons were at 22.1% lower odds of being completed than those served by non-Indigenous persons
- people with a history of childhood imprisonment were at 25.4% lower odds of being completed than those served by persons with no history of childhood imprisonment



- people assessed as having a high substance misuse need were at 14.3% lower odds of being completed than those assessed as having a low substance misuse need
- people assessed as having a high employment need were at 25.3% lower odds of being completed than orders served by people assessed as having a low employment need
- people living in regional and remote locations were at lower odds (10.4% and 3.6% respectively) of being completed than orders served by people living in major cities⁶
- people who had contravened the conditions of their order were at 91.4% lower odds of being completed than orders served by people who did not contravene their order.

Community corrections officers participating in the research identified a range of factors that can influence order outcomes that related to the characteristics of people under supervision and the context of order supervision (Figure 8). Many of these factors were consistent with findings developed from the analysis of quantitative information. For example, research participants often viewed employment as an important protective factor that was conducive to order completion and modelling work undertaken as part of the research project showed that orders served by employed people had higher completion rates than those served by individuals experiencing unemployment. Research participants also referred to the relationship between age and order completion. One research participant discussing the greater likelihood of order completion among older individuals commented:

You do get a bit more maturity about you [as you get older]. You'll have a lot of people say to you, "I'm too old to go back to jail, I'm just over it".

Research participants were also able to discuss factors that could not be explored using available quantitative data. For example, it was regularly suggested that the movement towards a more therapeutic approach to case management in recent years had supported the completion of orders.⁷ As one participant commented:

We started to change our management ... prior to that ... it was more compliance-focused.

The shift towards a more therapeutic approach was potentially evident in administrative data, which showed increases in the proportion of community-based orders never being contravened and increases in the proportion of orders never referred to the criminal courts in 2015–16 and 2016–17. Research participants also highlighted the positive role family and community can play in order completion, the latter being apparent in the following comment:

I think the community service projects in the [Indigenous] communities, are more meaningful. Because they are smaller, so the community can see that the guys [sic] are going and doing the gardening for older people, or going and working around the school... And maybe they are doing their work for their Aunty or a respected Elder in the community... then the community holds them more accountable.

The importance of referring people to support services to address presenting needs to support order completion and reduce the likelihood of further offending was regularly raised by research participants, however it was also understood that the availability of appropriate services varied across Queensland. One participant reflected:

The lack of available programs and supports in the community [is an issue].

Indeed, program waiting lists exceeding the length of orders among community-based services meant that some individuals were not able to complete the conditions of their order in certain locations.

Research participants also spoke of high caseloads, exacerbated by continued increases in the number of people under community supervision, which could affect their ability to support best-practice case management.⁸ As one participant commented:

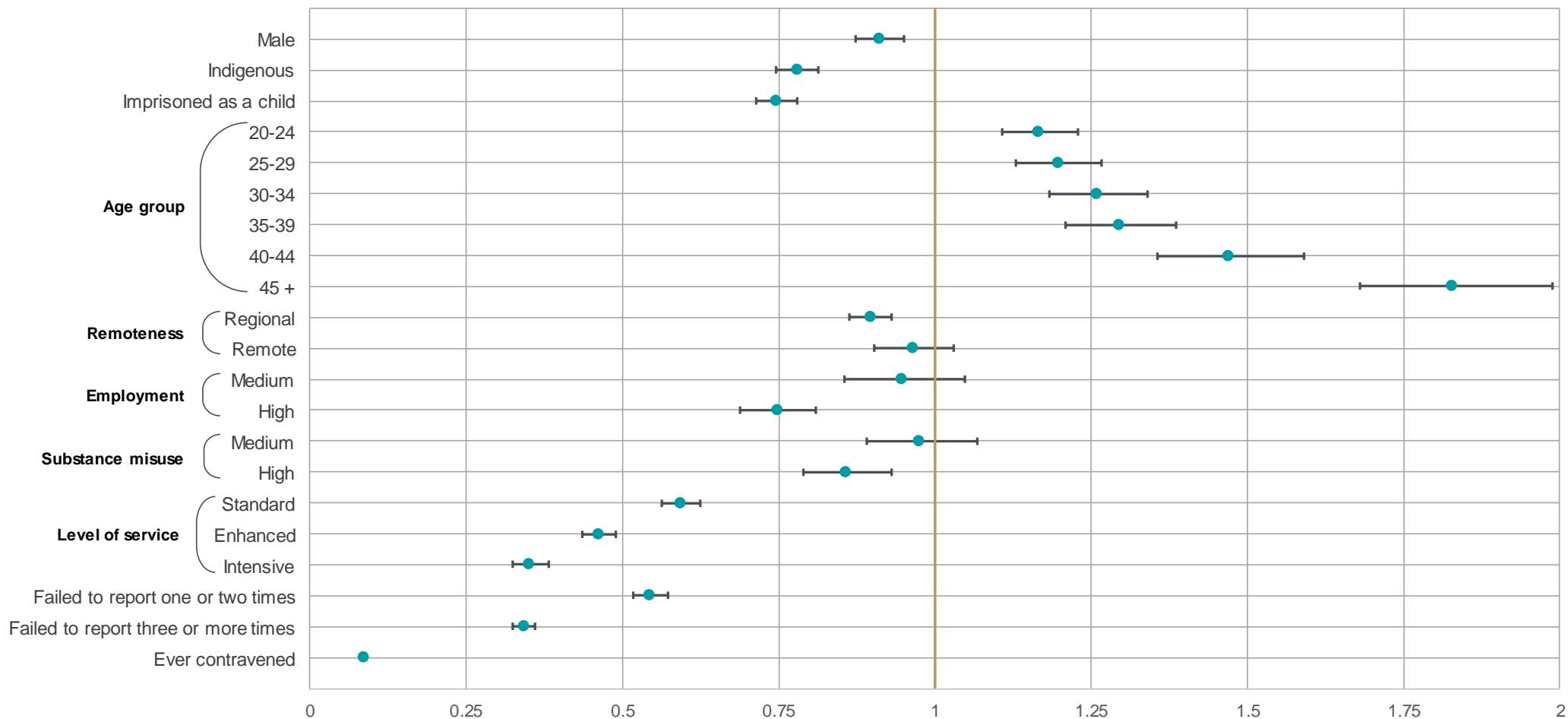
The staff here, you can tell that they want to do more, they just don't have the time or the resources.

⁶ Confidence intervals suggest that caution is required when interpreting the results relating to remote locations and community corrections officers discussed the ways in which remote communities can support order completion.

⁷ A therapeutic approach to order management involves addressing factors that may be contributing to order non-compliance and offending behaviour, as well as monitoring compliance with order conditions.

⁸ An operating context characterised by high caseloads is consistent with findings outlined in the *Queensland Parole System Review* which recommended that community corrections staffing levels be progressively increased.

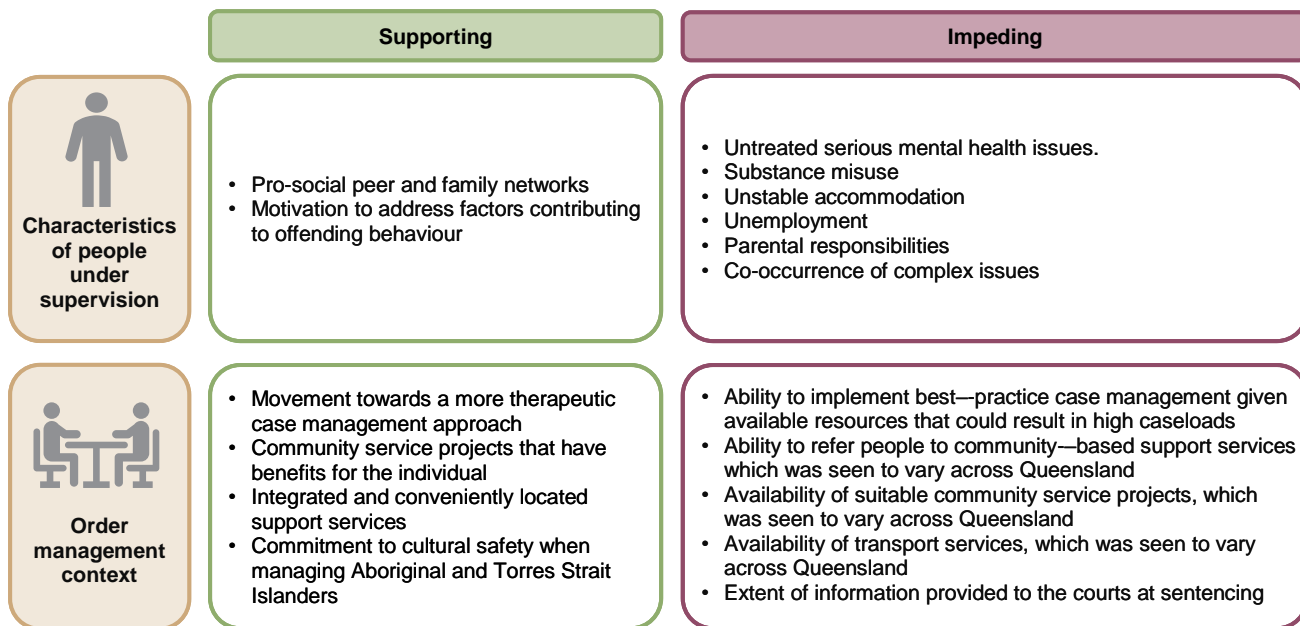
Figure 7 Odds ratios and 95% confidence intervals for selected explanatory variables



Notes:

1. Odds ratios (ORs) are presented above with associated 95% confidence intervals.
2. The absence of visible 95% confidence intervals for the "Ever contravened" variable is not an error.

Figure 8 Factors impacting order completion identified by research participants



4.0 Discussion

The order outcomes research project profiled community-based corrections orders and examined factors that could impact their completion in the Queensland context. This information can further inform the ways in which community-based orders are administrated and highlights the complex interaction of factors that can influence order outcomes. These factors include those relating to the characteristics of individuals serving orders, case management philosophies, available resources and local service ecologies.

Evidence suggesting a growing prevalence of substance misuse and unemployment among people serving orders and the relationship of these factors with order outcomes and involvement in crime draws further attention to the importance of responding to these issues. There may also be benefit in building a better understanding of the findings indicating a growing prevalence of mental health issues among those serving orders with consideration given to the implications of this for human services and the criminal justice system.

The slight increases found in overall order completion rates may be explained by the changing profile of orders and the people serving them, as well as the movement towards a more therapeutic approach to order administration. For example, the results showed relatively high growth in the number of orders served by women which have slightly higher completion rates than those served by men. Growth in the number of orders served by young adults was at a lower magnitude than growth in orders served by older people, and orders served by older people were characterised by higher completion rates than those served by younger people.

Growth in the number of orders under supervision was largely driven by a rise in the number of probation orders, which are the most common type of order and also experienced increases in order completion rates. When compared with reparation-type orders, probation orders potentially provide greater opportunities for the use of professional discretion and the implementation of therapeutic responses that can support order finalisation. The average length of probation orders also declined over the observation period which will have reduced the amount of time people were exposed to supervision thereby reducing their likelihood of contravention.

Some of the positive influences on order completion identified by the research may have been mitigated slightly by the growing prevalence of substance misuse and unemployment among those serving orders, high supervision caseloads and support service availability.

Appendix

1.1. In-scope orders

There are different types of community-based corrections orders available in Queensland. Some of these orders have the objective of supervising a person in the community (supervision orders), some have the primary objective of restitution and compensation (reparation orders), and some have the primary objective of supporting a person's transition into the community after serving time in custody (parole orders). A description of the orders included in the scope of the order outcomes research project is provided in Table 1.

Table 1 Description of orders

Supervision	
Probation order	<ul style="list-style-type: none"> Allows for an individual to be monitored and supervised in the community – probation period served must be between 6 months and 3 years. Conditions may include participating in programs or counselling, medical or psychological treatment. Probation may also occur after a period of imprisonment of not more than 1 year – probation period served after imprisonment must be between 9 months and 3 years.
Intensive correction order	<ul style="list-style-type: none"> Allows an individual to serve a sentence of imprisonment (of 1 year or less in length) under supervision in the community. Standard conditions include reporting to Community Corrective Services twice per week, participating in counselling or other programs, and performing community service.
Reparation	
Community service order	<ul style="list-style-type: none"> Requires an individual to perform a specific number of hours of unpaid community service. The order must be no less than 40 hours and no more than 240 hours. The hours must be completed within 1 year of the order being made (unless otherwise stipulated by the court). An individual must consent to the order being made, except in instances involving mandatory community service orders.
Graffiti removal order	<ul style="list-style-type: none"> If an individual is found guilty of a graffiti offence, the court must make this order. Requires an individual to perform a specific number of hours of unpaid graffiti removal. The order can be made for up to a maximum of 40 hours. The hours must be completed within 1 year of the order being made (unless otherwise stipulated by the court).
Queensland fine option order	<ul style="list-style-type: none"> Allows an individual to undertake community service in lieu of paying a fine imposed by the courts. The individual must: be unable to pay the fine or in paying the fine, the individual or their family would experience economic hardship (e.g. relies on benefits as main source of income); and, be deemed suitable by the court as being able to perform community service. The number of hours must be completed within 1 year (unless otherwise stipulated by the court; extensions may be available). The number of hours imposed must not be more than 5 hours per penalty unit (or part thereof). An individual on a fine option order must comply with a range of conditions.

1.2. Project limitations

The project had a number of limitations relating to the reliability of information, the availability of information and the scope of the project. These are discussed in further detail below.

The reliability of quantitative data presented in this report is subject to the accuracy of administrative data maintained by QCS, and the timing and ways in which administrative data have been extracted. The nature of qualitative research means that the views expressed by community corrections officers participating in the research and described in this report are not necessarily representative of all community corrections officers, QCS or the Queensland Government.

The project's scope does not include all orders that may be served by people sentenced to community-based corrections orders and people may serve more than one order at a time. This means information on the number of individuals serving multiple orders at the same time is not provided and in most cases analyses are order-based, rather than person-based.



A review of previous literature highlighted how the characteristics of people under supervision, the philosophical approach to order management, the skills of case managers, and underpinning approaches to order management can all influence order outcomes. The project's ability to explore these factors in-depth was constrained by the availability of information and the research strategies used by the project. For example, information on the number of case managers assigned to an individual while serving the order and participation in rehabilitation programs was not available. It would also have been beneficial to explore the availability and quality of community-based support services or programs; offender participation in, and outcomes of, therapeutic programs; and presentencing report data. However, these were out of scope given that information regarding these factors is not captured (or not captured reliably) by existing administrative systems.

The project did not examine the nature of special conditions on community-based orders (such as the court ordering individuals sentenced to probation or intensive correction orders to submit to medical, psychiatric or psychological treatment and/or illicit drug testing) given that this information was only available as text fields and would have required significant resources to quantify. This same restriction applied to reasons why orders were formally contravened, why orders were cancelled, and data on informal contraventions.

Information collected by QCS through the implementation of the benchmark assessment tool was used as indicator measures of presenting criminogenic needs. However, the benchmark assessment is not administered on all offenders supervised by QCS and dynamic factors (such as alcohol and drug use and mental health issues) may change while an offender is on an order. Such changes were not captured in the data set used to support the completion of this project. Similarly, a person's assessed level of service may change across time due to changes presented by individuals under supervision. It is also important to note that some of the information recorded as part of QCS assessment processes relies on information self-reported by individuals under supervision, which may impact the reliability of recorded information.

The model did not examine any explicit interaction effects between the included explanatory variables and order outcome; rather, it controlled for the influence of each factor to isolate the effect of respective explanatory variables. This limits the ability to directly inspect how each explanatory variable may interact with another to alter the odds of completion. Furthermore, the presented model did not independently inspect the effect of each explanatory variable on order outcome for the different order types. Analyses (not presented) did, however, show that the influence of the included variables remained largely the same when the modelling procedures were run separately for each order type. Similarly, the model does not control for time on order, however time on order is highly correlated with order and offence type. The model was constructed for the purpose of inference not prediction. Future work could include the creation of a predictive model, but more data would likely be required to address high false positive rate (FPR).

1.3. Measurement of presenting needs

The research used outcomes of the benchmark assessment as a measure of presenting criminogenic needs. This tool enables the assessment of 14 different factors and scores are translated into 'high', 'medium' and 'low' need categories (with the thresholds and need levels varying according to the issue being measured).

The information presented in this report does not distinguish between alcohol and illicit drug use and the criterion used to assess substance misuse includes questions regarding patterns of substance use and the impact of this use. The criterion used to assess mental health includes items on mental health history (ever and recent) and use of prescribed medical treatment; the general health assessment includes questions on current medications, current conditions and the receipt of financial support for medical condition/s. Clinical diagnosis of mental health issues is not available via the benchmark assessment tool.

Assessment of employment consists of questions relating to an individual's current employment status, longest period of employment, and whether they were employed for greater than 50% of the past year, while the accommodation assessment consists of questions on current living arrangements and stability of living arrangements in the preceding 12 months.

1.4. Model development

Orders-based data were used to construct the model. Approximately 6.7 per cent of records ($n = 6,785$) were excluded from the modelling procedure in cases where there was a missing explanatory variable. After exclusions, a final sample of 93,958 records across 59,884 unique individuals was retained.



Assessments of the bivariate association between the chosen explanatory variables and dependent variable (order outcome), were performed using Pearson's chi-square test of association. These analyses were undertaken to inspect if selected explanatory variables were significantly and independently associated with order outcome and to inform their suitability for inclusion in the final model. All associations were found to be significant at $p < .001$.

Following bivariate analyses, a series of logistic regression models was constructed using the chosen explanatory variables. Order contravention and remoteness variables were tested in both collapsed and non-collapsed forms to inspect the impact of comparatively low cell counts on the confidence intervals of resultant parameter estimates before identifying a final model combination that was the most coherent and best-fitting.

Variance inflation was calculated for the final model to ensure collinearity remained satisfactory and multicollinearity was not present. The variance inflation factor (VIF) is a measure of collinearity, or level of correlation, between two or more explanatory variables. The smallest possible value of VIF is one (1), showing a total absence of multicollinearity, with ranges exceeding 5–10 indicating potentially problematic levels of collinearity or the presence of multicollinearity (James et al. 2013).⁹ The results showed explanatory variables with an average VIF of 1.4 and a maximum value of 2.2, indicating the model contained satisfactory levels of collinearity and was free from potentially problematic multicollinearity.

1.5. Model fit

Goodness-of-fit assessments were undertaken to inspect the adequacy of the final model and was assessed by using external validation, Cragg and Uhler's Pseudo R^2 , and the area under the receiver operating characteristic (AUROC) curve. External validity of the model was assessed using cross-validation by conducting an 80:20 pseudo-random split, with the model trained on 80 percent of the dataset ($n = 75,166$) and then tested on the remaining 20 percent ($n = 18,792$). There was excellent concordance between the observed and predicted rates of order completion, with most predicted estimates being within 1 percentage point of the observed rate.

The sensitivity, specificity, and precision of the model were assessed with a range of threshold probabilities by calculating the true positive rate (TPR), FPR, and positive predictive value (PPV) respectively. The results for a threshold of .7 were found to be most appropriate with respect to the TPR (73.5%), PPV (75.3%), and FPR (19.5%).

AUROC is a measure of concordance between the observed and predicted values, with scores ranging between .5 (no discrimination), and 1 (perfect discrimination). An AUROC above .7 is considered to have an acceptable level of discrimination between groups, while an AUROC at or greater than .8 is considered to show an excellent level of discrimination (Hosmer and Lemeshow 2000). For the final model presented in this report, the AUROC was .7 (.71–.72), indicating an acceptable ability to discriminate between completing and non-completing orders. In addition to the AUROC, model fit was assessed using Cragg and Uhler's pseudo- R^2 statistic, the final model achieving an R^2 of .39 on a scale ranging from 0 to 1, with higher values indicating better model fit. There are no widely accepted threshold values for Cragg and Uhler's pseudo R^2 with respect to what values represent acceptable, good or excellent model fit (Hemmert et al. 2018)¹⁰, however Backhaus and colleagues (2006)¹¹ have suggested that values between .2 and .4 represent acceptable fit, with values exceeding .5 suggesting a very good fit. Given the above, it was concluded that the model was satisfactory with an acceptable goodness-of-fit.

⁹ James, G, Witten, D, Hastie, T & Tibshirani, R 2013, *An introduction to statistical learning*, Springer texts in statistics, Springer Science, New York.

¹⁰ Hemmert, GAJ, Schons, LM, Wieseke, J & Schimmelpfennig, H 2018, 'Log-likelihood-based pseudo-r2 in logistic regression', *Sociological Methods & Research*, vol. 47, no. 3, pp. 507-31.

¹¹ Backhaus, Klaus, Bernd Erichson, Wulffe Plinke & Rolf Weiber 2006, *Multivariate analysemethoden: Eine anwendungsorientierte einfuhrung*, 11 edn, Springer, Berlin, Germany.

