Ministry of Justice

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Prison Population Projections 2019 to 2024, England and Wales

This bulletin presents prison population projections for England and Wales from June 2019 to March 2024. It is produced to aid policy development, capacity planning and resource allocation within the Ministry of Justice (MoJ) and Her Majesty's Prison and Probation Service (HMPPS).

Main points

A decrease in the prison population is forecast over the short-term horizon to April 2021	↓	The prison population is projected to decrease in the next two years, to a low of 81,000 by April 2021. The underlying assumption of court demand remaining at recent lower levels has a gradual impact through to a lower prison population
Long term total prison population is expected to rebound	↑	Over the 5-year projection horizon the population is projected to increase slightly from the low in 2021, to 82,000 by March 2024, as a result of increasing longer-sentenced and recalled populations.
There is considerable uncertainty around the presented central projection		Projections account for best available evidence but changes to upstream factors such as crime, police resourcing, charges, sentencing and future policies will result in variation from projections and actual population. The forecast does not take into account impacts from prospective policies, in particular the planned recruitment of additional police resourcing or future review of sentencing for serious offenders.
The projected future population is lower than in the 2018 published projection	↓	The lower projection reflects latest available data, most notably the decrease in offenders sentenced because of decreasing charge rates. These have been offset partially by minor increases in determinate sentence lengths and an increasing recall population relative to the previous projection.
50 year-old and over population is projected to decrease	↓	The prison population aged 50 years and over is expected to decrease in line with total population.
Juvenile and female adult populations remain constant over the projection horizon	↔	The juvenile (15-17 year old) and adult female populations are not expected to change, whilst the adult male population is projected to follow a similar trend to the overall population projection.

Contents

Introduction

This bulletin presents prison population projections for England and Wales from June 2019 to March 2024. It is produced to aid policy development, capacity planning and resource allocation within the Ministry of Justice (MoJ) and the HM Prison and Probation Service (HMPPS). The latest published useable operational capacity (23rd August 2019) is 84,981[1].

The projection is produced using a model of flows of offenders into and out of prison which counts the resulting prison population each month. It is based on assumptions about future custodial convictions and incorporates the anticipated impacts of agreed policy. It does not, however, attempt to estimate the impact of any future Government policy that is yet to reach first reading in the House of Commons, and therefore becomes less certain over time. It also does not attempt to forecast future changes to crime or charges, instead assuming that future court receipts will broadly remain at recent levels.

The latest statistics and commentary on the current and historic prison population are published in the Offender Management Statistics Quarterly publication. This is available online on GOV.UK at: www.gov.uk/government/collections/offender-management-statistics-quarterly

The Story of the Prison Population provides a summary of what happened to the prison population between 1993 and 2016 and the major factors contributing to these changes:

www.gov.uk/government/statistics/story-of-the-prison-population-1993-to-2016

The central population projection does not yet reflect potential impacts of recent government announcements in relation to additional police resourcing and the review of sentencing for the most serious offenders, which may lead to a greater prison population projection than currently forecast. Please refer to section two for further details.

[1] www.gov.uk/government/statistics/prison-population-figures-2019

1. The 2019 total projection and custody type breakdown

The prison population was 83,116 as of Friday 23rd August 2019. It is projected to decrease in the short term to a low of 81,000 in April 2021, before increasing steadily to reach 82,000 offenders by March 2024.

In the period to April 2021, the reduction from the current level is due to decreased receptions of determinate sentenced offenders, as the level of court demand is assumed to remain at the current lower level.

Over the full projection horizon (beyond April 2021) the population begins to increase. This is due to the combination of a steady court demand forecast and build-up of longer sentenced determinate offenders; and an increasing recall population. Over this period, it is not however projected to return to current levels.

Figure 1.1: Total prison population projection, June 2019 to March 2024 (Source: Table A5)

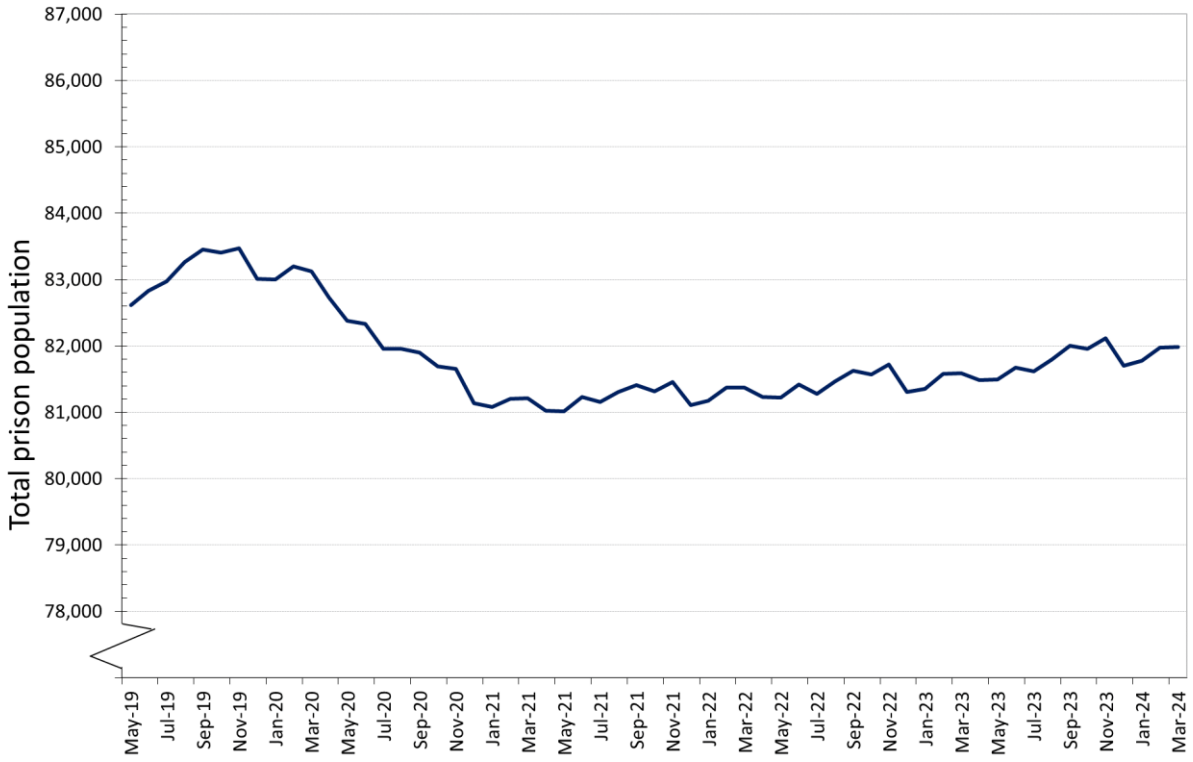

Figure 1.1 presents the prison population projection from July 2019 to March 2024. From the current population of 83,116, the prison population is forecast to decrease steadily to April 2021. This is a result of the assumption that current lower court demand will continue into future periods gradually impacting the prison population. The decreasing court forecast reflects the continued historical decrease in cases being brought to trial, and primarily impacts the population of longer sentenced offenders (greater than 12 months sentence) due to the amount of time these offenders typically spend in custody.

In the longer term to March 2024, increases are partially caused by the underlying growth in the population of offenders sentenced to longer determinate terms (in particular, those sentenced to 4 years or more). Growth in the sentenced determinate population also

reflects increases due to offenders sentenced to Extended Determinate Sentences[2] (EDS), following the abolition of Imprisonment for Public Protection[3] (IPP) sentences. The longer-term population increase also reflects the impact of the increasing recall population and expected impacts of recently implemented policies (see below for more detail).

Table 1.1 presents the prison population projection at a sub-population level, measured at an end of June position – June is typically a stable point that allows robust year on year comparison. Seasonal shifts in population (shown in Figure 1.1) reflect typical historical shifts in population levels observed in each month relative to underlying level or trend - typically associated with patterns of working days which impact on offender flows through the Criminal Justice System.

Table 1.1: Total prison population and by type of custody at end June 2019 and projections for June 2020 to June 2023

	Total	Remand	Determinate	Indeterminate	Recall	Non-Criminal[4]	Fine
June 2019	**82,676**	9,028	56,094	9,338	7,392	766	58
June 2020	**82,300**	9,000	55,600	8,900	7,900	800	100
June 2021	**81,200**	9,000	54,700	8,500	8,000	800	100
June 2022	**81,400**	9,000	55,100	8,200	8,200	800	100
June 2023	**81,700**	9,000	55,400	8,000	8,300	800	100

*Figures may not sum due to rounding of projected figures to nearest 100

The indeterminate population is forecast to continue to decline over the period. This population consists of offenders who serve IPP and life sentences. Offenders can no longer receive an IPP sentence due to its abolition in 2012, with current IPP offenders being released by the Parole Board. Any such released offenders subsequently recalled will be counted in the recall projection.

The Recall population[5] is projected to increase above current levels, for both the determinate and indeterminate sentenced cohorts. Projected growth in the determinate sentenced recall population continues the historic increasing trend in the rate at which these offenders are recalled to prison, for the first six months of the projection period. Growth in the indeterminate sentenced recall population is due to an expected increase in the pool of

[2] Extended Determinate Sentences are sentences for dangerous criminals convicted primarily of serious sexual and violent crimes with no automatic release from prison halfway through their sentence. The offender will either be entitled to discretionary release at the two thirds point of the custodial sentence or be entitled to apply for parole from that point. If parole is refused the offender will be released at the expiry of the prison term.

[3] Sentences of Imprisonment for Public Protection (IPPs) were created by the Criminal Justice Act 2003 and started to be used in April 2005. Offenders sentenced to an IPP are set a minimum term (tariff) which they must spend in prison. After they have completed their tariff they can apply to the Parole Board for release. The Parole Board will release an offender only if it is satisfied that it is no longer necessary for the protection of the public for the offender to be confined.

[4] Non-criminal prisoners are held for civil offences or under the immigration act. A civil non-criminal prisoner is someone held in prison because of a non-criminal matter, for example, non-payment of council tax or contempt of court. The non-criminal population also includes immigration detainees that have finished serving their sentence and are being kept in prison by immigration authorities or those detained in HMPPS operated Immigration Removal Centres (IRCs).

[5] Offenders are released from custody under licenced supervision, subject to a set of conditions such as living at an approved address. If the offender breaches the conditions of their licence they may be recalled into prison.

offenders on licence, particularly as further IPP offenders are released, a proportion of which will be recalled to custody.

Further changes in the prison population are expected as the result of a range of policies, including those already in effect but not yet fully represented in the population and those expected to take effect over the projection horizon. The projections only consider the impact of government policies which have achieved first reading in the House of Commons. Such policies are then evaluated on a case-by-case basis, to assess the likelihood of the policy achieving Royal Assent[6] and thus the estimated impacts being appropriate to include in central projections. These include:

- The impacts of the Criminal Justice and Courts Act 2015 which includes provisions for restricting the use of cautions; changes to the framework for the sentencing and release of serious and dangerous sexual and violent offenders; and the introduction of a new test for the release of recalled determinate sentence prisoners[7];

- The impacts of the Serious Crime Act 2015 which includes provisions for additional caseload and associated custodial sentences relating to new offences for controlling or coercive behaviour in an intimate or family relationship[8];

- The expected impacts of the Sentencing Council guidelines on reduction of sentence for early guilty pleas[9];

- The expected impacts of the Offensive Weapons Act 2019, which provides the justice system with the powers needed to address serious violence and aims to limit the availability of knives, corrosive substances and firearms. The Act introduces several new offences as well as increasing the maximum sentence length for existing offences.[10]

The central population projection does not yet reflect potential impacts of recent government announcements in relation to additional police resourcing and the review of sentencing for the most serious offenders; refer to section two for further details.

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[6] Once a bill has completed all parliamentary stages, it is ready to receive Royal Assent. This is when the Queen formally agrees to make the bill into an Act of Parliament (source: www.parliament.uk/about/how/laws/passage-bill/lords/lrds-royal-assent/)

[7] www.gov.uk/government/publications/criminal-justice-and-courts-bill-impact-assessments

[8] www.gov.uk/government/uploads/system/uploads/attachment_data/file/370943/Serious_Crime_Bill_-_Overarching_Impact_Assessment_-_Commons_Intro.pdf

www.gov.uk/government/uploads/system/uploads/attachment_data/file/393814/Impact_Assessment_-_Strengthening_the_Law_on_Domestic_Abuse.pdf

[9] www.sentencingcouncil.org.uk/wp-content/uploads/Guilty-plea-resource-assessment.pdf

[10] assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/717684/Impact_Assessment.pdf

2. Uncertainty in the projection

Purely based on historic deviations between projections and out-turn over the past 5 years there is a 20% likelihood that the prison population will reach or exceed 84,200 and a 5% likelihood it will reach or exceed 85,200 in June 2020. There is a 20% likelihood that the prison population will reach or exceed 85,200 and a 5% likelihood it will reach or exceed 87,300 in June 2023.[11]

The likelihood of the prison population falling within ranges around the projection is estimated based on performance of previous prison population projections. This does not take into account impacts from prospective policies, including the recruitment of additional police resourcing or future review of sentencing for serious offenders.

The Prison population projections are informed by the latest available published data. They also reflect assumptions – accounting for the best available evidence at the time – as to future demand levels in the Criminal Justice System such as crime, charges, sentencing outcomes and uncertain policy impacts yet to come into effect. Unanticipated changes to government policy, as well as offender, police and sentencing behaviours, will inevitably mean the actual prison population in future years will differ to some degree from projections.

In particular, the government's commitment to the recruitment of 20,000 new police officers is expected to increase charge rates and as such is likely to result in a higher future prison population than may otherwise be expected. The recently announced review of sentencing for the most serious offenders may also lead to a greater variance, should sentencing reforms be implemented. The implementation period and expected impacts of both policy commitments are not yet certain and as such no allowance for these has been made in both the central projection and uncertainty ranges provided.

Assuming the factors influencing the prison population have not become inherently more volatile or unpredictable, it is possible to use the performance of previous projections (e.g. measures of actual population relative to projected levels) to estimate likely ranges of the future prison population relative to the central estimate. Our modelling methodology for estimating uncertainty has been refined since 2018 (see section TG4 for details) and the revised uncertainty methodology now assesses performance of all previous projections, to give a larger set of data on which to base uncertainty estimations.

Based on previous forecast performance, 12 months after publication the actual population is expected to be within ±2.1% of the projection 60% of the time. After 48 months the actual population is expected to be within ±4.3% of the projection 60% of the time.

Figure 2.1 shows the central 2019 projection and three shaded bands indicating ranges and likelihood of population out-turn. These bands reflect the scale of historical deviations relative to previous published projections. Ranges with 30%, 60% and 90% likelihood of actual future prison population falling within the given range are shown.

Table 2.1 shows the same uncertainty ranges expressed as the likelihood that population will reach or exceed that level.

[11] June figures are reported as a stable in-year position not subject to seasonal trends. This allows comparison of underlying population level between years. It is possible that the population projection exceeds these levels between June figures presented (see Figure 1.1 for seasonal pattern).

Figure 2.1: Uncertainty in 2019 total population projection, June 2019 to March 2024 (Source: Table A7)

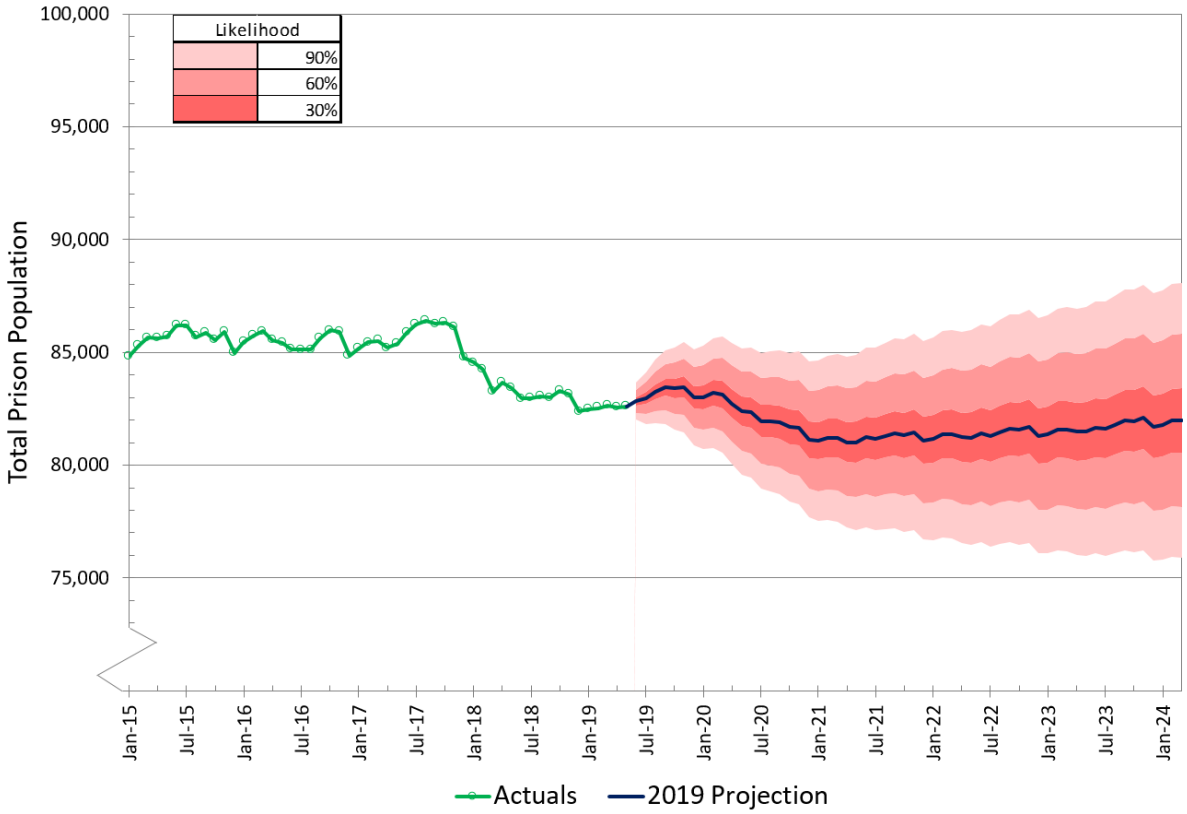


Table 2.1: Estimated likelihood of prison population reaching or exceeding levels, June 2020 to June 2023[12]

	95%	80%	65%	50%*	35%	20%	5%
June 2020	79,400	80,500	81,700	**82,300**	83,000	84,200	85,200
June 2021	77,300	78,700	80,300	**81,200**	82,200	83,700	85,200
June 2022	76,600	78,400	80,300	**81,400**	82,500	84,500	86,300
June 2023	76,100	78,200	80,400	**81,700**	83,000	85,200	87,300

*50% likelihood represents the 2019 projection
**Intervals may not appear symmetrical due to rounding of figures to nearest 100

[12] Likelihood ranges in Figure 2.1 are here split into their symmetrical lower and upper bounds and the likelihood of actual population reaching or exceeding those levels. For example, the 60% likelihood range in Figure 2.1 contains all values greater than or equal to the 80% level and less the 20% level (i.e. for a net 60% likelihood of falling between those levels).

3. Comparison against 2018 total population projection

As of June 2019, the prison population was 1,000 places below the previous 2018 projection.

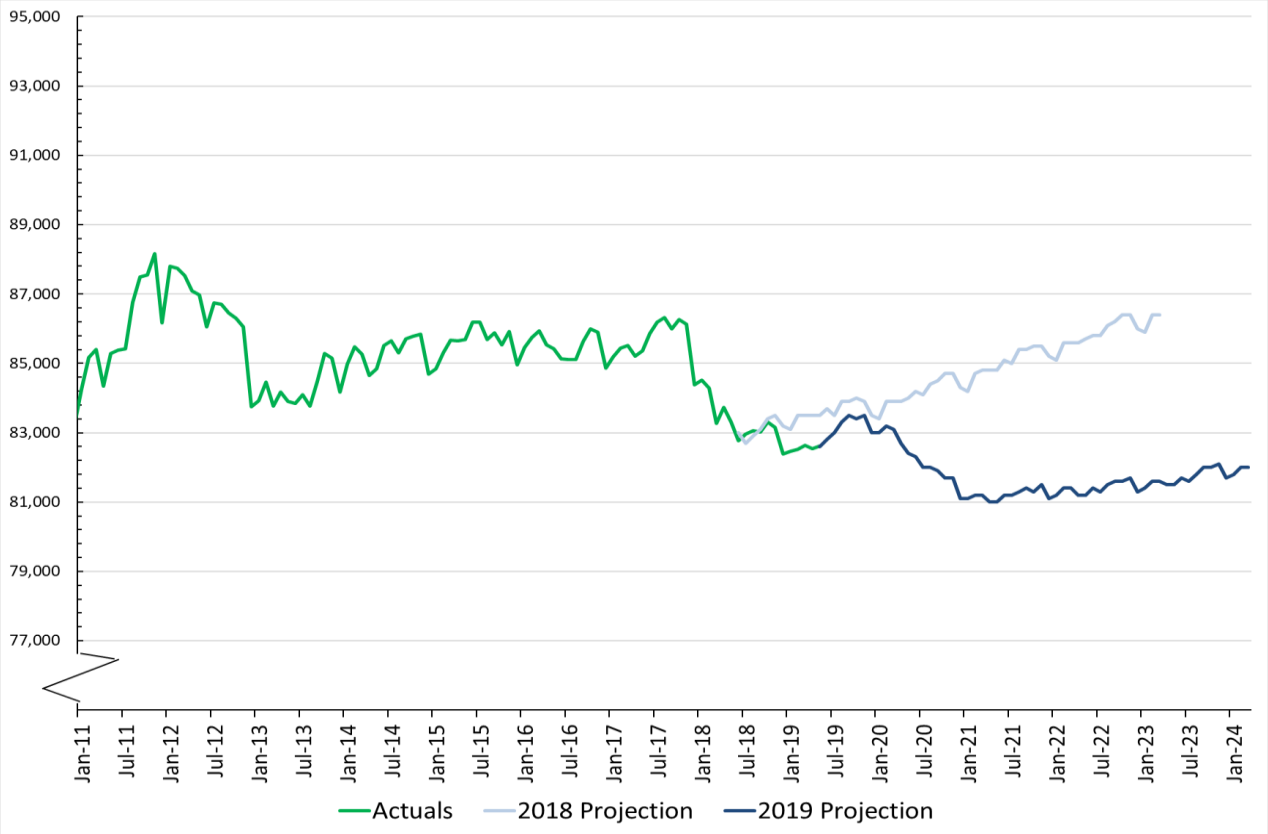
The 2019 projection is 1,800 places lower than the 2018 projection in June 2020 and 4,800 places lower in March 2023.

The lower forecast reflects the decrease in court demand and thus the determinate sentenced population since our 2018 projection. This is partially offset by the increased recall population.

The lower court demand assumption causes the 2019 projection to continue to decrease below the 2018 projection, and long term growth is forecast to be slower than in the previous projection.

A comparison of the 2018 projection against actuals to date and the latest 2019 projection is presented in Figure 3.1.

Figure 3.1: Comparison of August 2018 total population projection against actuals and latest August 2019 projection (Source: Table A5 and Table A6)



The 2019 projection reflects more recent data available on prison population, prison receptions and discharges as well as shifts in the sub-offence mix of cases within the criminal justice system, and associated implications for sentencing outcomes.

The number of recorded crimes which resulted in a charge or summons fell by 2% between 2017 and 2018 and over the longer term has been decreasing since 2011. As a result, the number of case receipts at Crown Court fell over the same period by around 10%, leading to a reduction in immediate custodial sentences by 9%. These decreased levels of demand

in the Criminal Justice System are used as a baseline for the 2019 projection, resulting in lower prison receptions and thus a lower determinate sentenced population.

Offsetting this decrease, we have continued to see an increase in average custodial sentence lengths across most indictable offence types, for those offenders sentenced in 2018 relative to 2017. Thus, whilst fewer offenders are being sentenced to custody, those who are sentenced are expected to stay longer than those currently serving a custodial sentence. This results in a long-term population increase in the projection for the determinate sentenced population, particularly in the cohort of offenders given a sentence length greater than four years.

The recall population has increased from 6,300 offenders at the end of June 2018 to 7,400 at the end of June 2019 and thus the 2019 projection for this sub-population starts from a higher baseline compared to 2018. The 2019 determinate sentenced recall population projection is higher than the flat forecast assumed in the 2018 projection, due to the increasing trend in the rate at which longer determinate sentenced offenders are recalled to prison being assumed to continue for the first six months of the projection period. The recall population is projected to rise to 8,200 at the end of June 2022 (2018 projection: 6,700 at June 2022).

The remand population is assumed to remain flat at current level throughout our projection, in line with the future court receipts assumption. Remanded offenders have decreased slightly since our 2018 projection, most likely because of the decreased court activity.

4. Projection of over 50, 60 and over 70 year-old populations

The population of over 60 and over 70 year-olds in prison are projected to remain constant over the projection horizon, both in absolute terms and as a proportion of the total prison population.

This is a change to our previous increasing forecast for these populations, and is predominantly driven by decreasing indeterminate offenders and a reduction in the proportion of sexual offence cases.

Table 4.1 shows projections of prison population aged 50-59, 60-69 and over 70 years old. The 60-69 and over 70 year old sub-populations are projected to remain constant both in absolute terms and as proportions of the total population. The population of 50-59 year-old offenders is projected to decrease in both absolute terms and as a proportion of total population from 10% to 9% over the projection horizon.

Table 4.1: Prison population aged over 50, 60 and 70 years old, June 2019 actuals and projected June 2020 to June 2023

	Total	50 to 59	60 to 69	70 and over
June 2019	82,676	8,532	3,321	1,756
June 2020	82,300	8,100	3,200	1,800
June 2021	81,200	7,900	3,100	1,700
June 2022	81,400	7,700	3,100	1,800
June 2023	81,700	7,600	3,100	1,800

*Figures may not sum due to rounding of projected figures to nearest 100

The 50 year-old and over population is projected to decrease from 13,609 as at June 2019, to 12,500 in June 2023. The 60 year-old and over population is projected to also decrease from 5,077 to 4,900 over the same period. The 70 year-old and over population is projected to remain broadly constant at 1,800 over the projection horizon.

Historically the number of offenders aged 50 and over in custody had been increasing steadily before stabilising over the 2018 calendar year, primarily as a result of an increase in the proportion of sexual offence cases being received, which typically have an older age profile than the general prison population. The decreasing prevalence of sexual offence case being heard at court in the last 12 months therefore results in a lower assumption of such offenders entering the system in future periods and causes a gradual decrease in the over 50 age group over the projection horizon. This decrease is compounded by the declining IPP and Lifer populations, which include a higher proportion of offenders over 50 years old.

5. Projection of age and gender cohorts

The juvenile and female adult populations in prison are projected to remain constant over the projection horizon, whilst the male adult population follows the trend projected in the overall prison population

The juvenile and female adult cohorts make up a small proportion of the total population and decrease slightly over the projection horizon because of reduced court demand. The male adult population follows the overall trend.

Table 5.1 shows projections of prison population by those aged under 18 and by gender. The juvenile and female adult sub-populations are projected to remain broadly stable over the projected horizon and do not increase in the longer-term as there are fewer longer sentenced offenders in these cohorts. The male adult sub-population follows the overall projection trend, including a long term rebound because of increased sentence length assumptions for more serious offenders.

Table 5.1: Prison population by age group and gender, June 2019 actuals and projected June 2020 to June 2023

	Total	Juvenile**	Female Adult	Male Adult
June 2019	82,676	583	3,766	78,327
June 2020	82,300	600	3,800	78,000
June 2021	81,200	600	3,700	76,900
June 2022	81,400	600	3,700	77,100
June 2023	81,600	600	3,700	77,300

*Figures may not sum due to rounding of projected figures to nearest 100

** The prison population projections cover offenders held in HM Prison and Probation Service (HMPPS) estate. Currently this includes a number of juvenile males in the 15-17 age group, but no females. We do not project any female juveniles to enter the prison population.

The adult male (18 and over) population is projected to decrease from 78,327 as at June 2019 to 76,900 by June 2021, before increasing again to 77,600 at March 2024. Supporting table A3 provides a further breakdown of the young adult population (aged 18-20 inclusive), which is projected to increase slightly from the current population of 4,076 (June 2019) to 4,200 over the projection horizon. The age population categories provided in table A3 are based on the availability of underlying statistics used in the forecasting methodology sourced from across the Criminal Justice System – covering, for example, court activity and sentencing data inputs.

The female population is projected to decrease from 3,766 as at June 2019 to a constant level of 3,700 offenders over the remainder of the projection period. This projection does not explicitly include any population impact attributable to the Female Offender Strategy, as the impacts are not robustly quantifiable and thus (as per guidance note TG2) not eligible for inclusion in the baseline projection.

The juvenile population covers only offenders held in HMPPS estates and includes males in the 15-17 age group. This population is projected to remain broadly constant at 600 offenders over the projection period. Note that the projections do not cover those young offenders held in Secure Children's Homes or Secure Training Centres.

6. Links to related Ministry of Justice statistics

For further information on:

- The latest statistics on court receipts visit: www.gov.uk/government/collections/criminal-court-statistics
- The latest statistics on the criminal justice system, including information on sentencing, visit: www.gov.uk/government/collections/criminal-justice-statistics-quarterly
- The latest statistics and commentary on the prison population visit: www.gov.uk/government/collections/offender-management-statistics-quarterly
- The Story of the Prison Population 1993-2016 visit: www.gov.uk/government/statistics/story-of-the-prison-population-1993-to-2016
- Weekly prison population and capacity figures visit: www.gov.uk/government/collections/prison-population-statistics

TG1. Modelling methodology

The prison projections model is part of wider work within the Ministry of Justice to develop a consistent and coherent suite of models of the criminal courts and offender management, driven by common projections of demand for the Ministry of Justice's services. Two key components of this suite are used to develop these projections, a custodial sentencing model and a prison population projection model.

The custodial sentencing model is driven by projections of numbers of defendants entering the criminal courts. To project volumes of defendants being given a custodial sentence, it also takes into account:

- the age band, sex, and offence of offenders entering prison;
- the court type and court route defendants have come through;
- resources required to process cases through the courts; and
- the sentences which concluded cases attract.

The prison population projections model takes projections of custodial sentences, converts them to projections of prison receptions and then models the amount of time that offenders spend in prison to calculate the resulting prison population. The model also simulates the ageing of the prison population over time. The benefits of this method are that it allows us to:

- explicitly project custodial sentences (rather than just sentences);
- understand the criminal justice system factors which contribute to change in the prison population, such as time served, sentences given, changes to court processes or shifts in defendant demographics; and
- more easily model the impact on the prison population of specific Ministry of Justice and other criminal justice agency policy changes relating to specific offences or specific sentences.

The assumptions informing these projections, and therefore the projections themselves, are subject to uncertainty. The level of uncertainty of the projections is estimated and presented in Chart 2.1 and Table 2.1 above and in Table A.7 of the accompanying statistical tables. The methodology applied to estimate projection uncertainty is outlined in section TG4.

The projection model is based on latest available data from various sources including court proceedings and performance data, and sentencing data. Latest P-NOMIS extracts, referenced in offender management statistics, are utilised to model prison receptions and population data.

The method used for generating projections of the prison population in England and Wales for the 2019-2024 projections is consistent with the approach used to generate the 2018-2023 projections published on 23 August 2018.

Sections TG2 and TG3 provide further details of the methods used to produce the prison population projections and the assumptions behind them.

TG2. Caveats on prison population projections

The projections presented reflect the impact of trends in sentencing, in the age band, sex, and offence of defendants entering the system and in the flow of defendants through the courts. The impacts of publicly announced changes to legislation and guidance which took place before August 2019 and views of future parole hearing frequency and outcomes for indeterminate sentence prisoners have also been accounted for.

The projections do not reflect the impact of legislative, policy, operational or procedural change or guidance for which there is no definite timetable for implementation. The projections therefore provide a "baseline" against which the impacts of future changes can be assessed.

Even without these possible changes, the actual future prison population may not match the projection. Changes to criminal justice processes could influence the numbers of offenders being brought to the point of sentence or the way that offenders are managed. Changes to sentencing behaviour may also be different from those modelled. Finally, both sentencing behaviour and criminal justice processes, as well as policy decisions, can respond to a multitude of environmental factors which cannot be anticipated, such as high profile criminal cases, events like the August 2011 public disorder events, and public debate.

Assumptions for modelling were agreed through consultation with policy and operational experts at the Ministry of Justice, Her Majesty's Prison and Probation Service, Home Office and Crown Prosecution Service. The assumptions are based on analysis (where reliable data are available) and on expert judgement from policy makers, key deliverers and system influencers. The assumptions are therefore likely to be more robust for those measures and processes that have a well-defined boundary than for those that do not.

TG3. Detail of models and assumptions

The modelling approach

The prisons model used to generate this projection has not changed substantially from that used in the last projections. As in the 2018 projections, custodial sentence lengths used in the model are disaggregated by sex and age band of the offender, and the offence type. The total time to be served in prison by projected future prisoners is assigned by matching their sex, age band, and offence characteristics to relevant distributions of (i) custodial sentence lengths and (ii) the percentage of custodial sentence served. These distributions are derived from latest available data (2018 calendar year). This allows us to:

- understand the criminal justice system factors which contribute to change in the prison population, including sentence lengths issued, the percentage of sentence served in custody, court route for trials, or shifts in the demographic characteristics of defendants;

- model the impact on the prison population of specific Ministry of Justice and other criminal justice agency policy changes; and

- quantify the impact of uncertainty around the time a defendant serves in prison on the prison population.

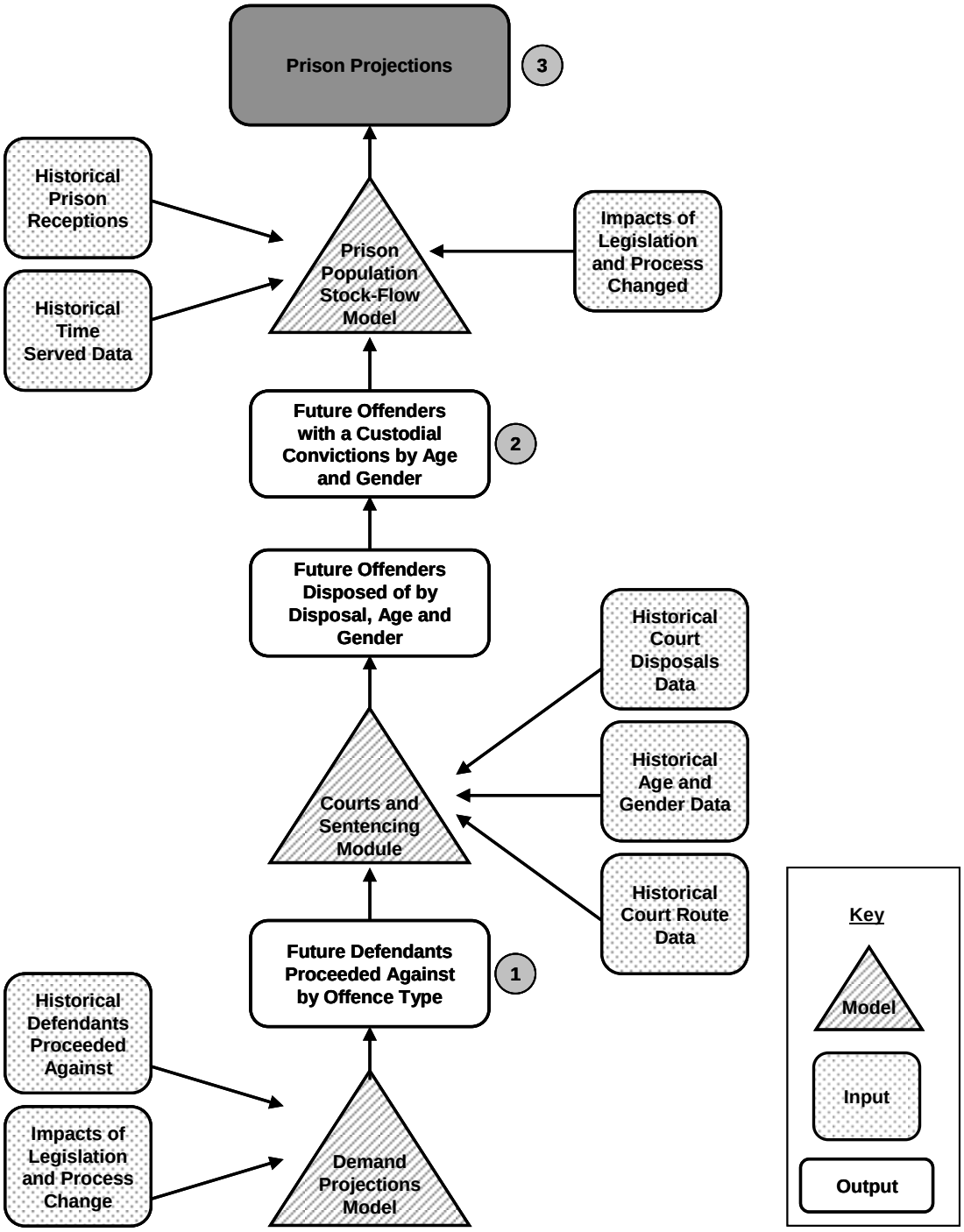
Overview of the modelling approach

Central to the modelling approach is the Prison Population Stock-Flow model. Projections of future custodial sentences are fed into this model and outputs are adjusted to account for the impact of changes in legislation and process on the prison population, as shown in Figure B1, and described below.

1) Producing projections of defendants proceeded against

Projections of defendants proceeded against at court are chosen as the entry point to the modelling system because this is the entry point of defendants into the Ministry of Justice's area of responsibility. Underlying crime levels and the activities of the police and CPS will have an impact on the volume of defendants proceeded against.

Figure B1: Key Components of the prisons projections modelling system



The Demand Projections Model produces baseline projections of all defendants proceeded against at court for high-level offence categories subdivided by court.

The court demand projections into account recent levels of demand and seasonal components of court receipts data. For this projection we have assumed that the number of cases received at the courts remain at the levels observed in the twelve months to early 2019. Cases received (in addition to current outstanding caseload) are

then projected to be heard based broad assumptions to reflect the listing process and the planned sitting days for each financial year.

It should be noted that these projections cannot be expected to track actual volumes of defendants proceeded against if there is any sudden or cumulative change which takes demand volumes or offence mix well outside the trends seen historically.

2) Converting the demand projections into custodial sentences

A Courts and Sentencing Module converts the demand projections into a set of projections of disposals by disposal type (including custodial convictions), offence, sex and age band at a monthly resolution. These projections of custodial sentences by sex, age band and offence type are used as a key input for the Prison Population Stock-Flow model.

The Courts and Sentencing Module is a combination of the magistrates' and Crown Court Workload Models and the Sentencing Module. The demand projections are used as an input into a magistrates' Workload Model, which uses historical data to split defendants into court routes (Table B1) and tracks their flow through the system.

The Crown Court workload model takes forecasts of demand and assigns various attributes (e.g. early guilty plea and bail remand status) to estimate likely hearing times and taking account of court resources estimates the resulting flow of cases through the system.

The key assumptions that are used in the Courts and Sentencing Module are:

- that there is no prioritisation of any age or sex group within the magistrates' and Crown Court;
- the number of working days in each month is the primary driver of seasonality within the magistrates' and Crown Court;
- no change in offence type occurs as cases move through the system;
- lags within the magistrates' Court are not significant for the monthly timescales used in the modelling; and
- a magistrates' Court backlog will not develop during the forecast period.

The Sentencing Module takes cases disposed of in the magistrates' Workload Model and the Crown Court Workload Model and applies sentencing splits based on analysis of court proceedings data. This results in a set of projections as broken down in Table B1. These are aggregated providing forecasts for each offence, sex, age band, and disposal category, which are used as the custodial sentence projections.

Table B1: Courts and Sentencing Module Splits Dimensions

Offence Group	Sex	Age Band	Court Route	Disposal Type
Violence against the person	Male	Age 10-17	MC	Discharge
Sexual offences	Female	Age 18-20	MC/CC	Fine
Robbery		Age 21+	CC	Community Sentence
Theft Offences				Suspended Sentence
Criminal damage and arson				Custodial < 6 months
Drug offences				Custodial 6 months < 1 year
Possession of weapons				Custodial 1 year < 4 years
Public order offences				Custodial + 4 years
Miscellaneous crimes against society				Indeterminate
Fraud Offences				Otherwise Dealt With
Summary non-motoring				
Summary motoring				

Key to the court route splits:

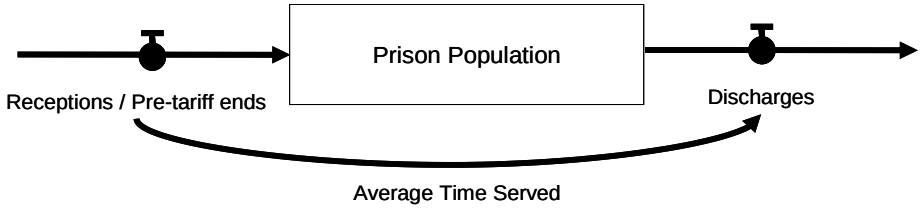
- MC: those tried and sentenced in the Magistrates Court;
- MC/CC: those tried in the Magistrates Court and Sentenced in the Crown Court;
- CC: combines those defendants who are committed for trial in the Crown Court and sent for trial in the Crown Court into a single category.

If required, the Courts and Sentencing Module allows trends in offender demographics and courts and sentencing processes to be incorporated into custodial sentence projections.

3a) Producing prison population projections

Prison population projections are produced using the Prison Population Stock-Flow Model. The principal sub-populations in prison – determinate sentence, life sentence, imprisonment for public protection (IPP) and recalls – are modelled using stock-flow structures based on the generic structure shown in Figure C2. The stock-flow structures model the flow of offenders into and out of prison and count the resulting prison population at the end of each month.

Figure C2: Generic stock-flow structure in the Prison Population Stock-Flow Model



For the determinate population, the monthly inflows to prison are based on the custodial sentence projections described above. These custodial sentences include offenders that may already be serving a sentence for a previous crime or those who would serve their whole custodial sentence on remand, meaning that they would not be a new reception to prison. To convert from custodial sentences to prison receptions a conversion ratio derived from the historical proportions of custodial sentences is applied to prison receptions for each sub-population averaged over 2018 data.

Monthly outflows for the determinate population are based on observed custodial sentence lengths and the observed percentage of sentence length served. Each projected offender that enters the model is given a custodial sentence length that is randomly selected from the relevant distribution. These distributions are populated with custodial sentence lengths from actual offender receptions who share the same characteristics of offence, sex, and age band in the observed time period. The percent of custodial sentence length served is derived in the same manner, except that the observed distribution is made up of discharged offenders further disaggregated by custodial sentence length band.

For offenders who receive an EDS sentence an adjustment is made to the percent of custodial length served to reflect that these offenders will spend a greater proportion of their sentence in custody than standard determinate sentenced offenders discharged to date.

Projected prison receptions are sub-divided by age band (Juvenile, Young Adult, Adult) with the exact age of the offender attributed in the same manner as the custodial sentence lengths. This allows the model to explicitly age the offenders whilst in prison (e.g. move from Juvenile to Young Adult categories).

The approach for the other sub-populations is similar and has not been substantially revised since the 2018 publication, except for the determinate sentenced recall population. The methodology applied to each is briefly outlined below.

IPP and life sentence prisoners have an extra section in the stock-flow structure which models the indeterminate nature of their sentence lengths. Outflows for IPP and life sentence prisoners depend on the tariff lengths they receive and on the frequency and outcome of Parole Board hearings. The values of these parameters are set and calibrated to reflect the most recent management information on Parole Board outcomes.

Indeterminate recalls are treated explicitly based on data and assumptions around future release and recall rates, and conditional on Parole Board capacity as per the indeterminate population. Determinate recalled offenders are projected by estimating the size of the eligible pool of offenders subject to licence conditions, split by sentence band, and applying a monthly ‘rate of recall’ to this pool to estimate new recallees. A profile of average time spent in custody recalled is then applied to estimate re-releases, and thus simulate the determinate sentenced recall population.

Of the other sub-populations, remand is the largest and is projected flat based on the latest end of month population figure. The non-criminal population is projected based on the last observed monthly data point, adjusted for any planned changes to capacity for Home Office detainees or Immigration Removal Centres. The fines population is projected based on an average of the population over the previous twelve months.

The population in prison at the end of each modelled month is aggregated into the categories defined by sex, current age band and, for determinate sentence prisoners, sentence length band, to produce raw, unadjusted prison population projections.

3b) Accounting for the impacts of circumstance, legislation, and for seasonal effects

The raw, unadjusted prison population projections are subject to model adjustments to show the impact of certain policy impacts, such as the Criminal Justice and Courts Act 2015, or the Sentencing Council Guideline on Early Guilty Pleas. Model adjustments are also used to account for seasonal variation in the population.

Custodial sentence projections for each sub-population were smoothed using a twelve month average for each financial year. No seasonality in prison receptions and discharges was modelled explicitly. Seasonality was measured in the historical prison population and applied as a series of percentage adjustments to the final population projections. Seasonal factors for the determinate population were identified for each month by measuring statistically significant deviations from a centred twelve month average.

3c) Splitting out projections into over 50, 60 and 70 year-old populations

The final prison projections undergo a further bespoke piece of analysis in order to split out age bands 50-59, 60-69, and 70 and over from the total adult population.

In the case of the remand, non-criminal, and fine populations, we have assumed the current proportion of age bands will hold in future months.

The Prisoner Population Stock Flow model for the determinate population allows these age-bands to be modelled explicitly, as the exact age of the offender is attributed using a distribution of observed offenders ages on entry, of a given time period and category. The model then ages the offenders whilst in prison, allowing us to determine movements in/out of age-bands at any point (e.g. offenders moving from 21-49 to 50-59 year olds as they age in prison).

The projected age-bands for indeterminate offenders are produced by simulating the aging of current offenders in custody over time. For the lifer population, we use the difference in age distributions of those entering custody from those leaving custody to inform how the total lifer population will age as offenders continue to enter and leave. For the IPP population, there are no incoming offenders and thus aging of existing offenders is sufficient.

Recall populations are assumed to age at the same rate as the non-recall populations, modelled separately for determinate and indeterminate sentenced populations respectively.

TG4. Method for calculating projection uncertainty

As with any projection, there is uncertainty in the projection of the prison population, arising from several sources. This includes uncertainty in model parameters as well as future changes in behaviour or policy that are uncertain or unexpected at the time of projection.

This publication includes a fan chart, a commonly-used method of communicating uncertainty in a time series projection. The performance of previous published projections against the actual population has been analysed and used to estimate the uncertainty in the prison population.

Projections of the total prison population have been published annually since 2008, as well as more frequent projections produced for internal planning purposes. A back series of projections is therefore available to compare projected population levels against actuals. The fan chart should be considered an estimate of the expected levels of uncertainty, informed by past performance, rather than a precise set of limits on the population.

Fan chart and interpretation

Chart 2.1 shows the central prison population projection as a solid line. Around the projection are three bands, indicating the range of populations with estimated 30%, 60% and 90% likelihoods. The interpretation is that, assuming no significant differences between the conditions under which the previous projections were made and the conditions under which the current projection has been made, there is a 30% likelihood that the population will stay within the inner band, a 60% likelihood that the population will stay within the second band and a 90% likelihood that the population will stay within the outer band.

Technical details

The fan chart is calculated by fitting a distribution to the percentage errors between prior projections and observed actual population figures. Distributions of errors are calculated at each time interval from date of start of projection. A normal distribution is fitted at each interval, characterised by a mean and a standard deviation. For this fan chart, the mean is assumed to be the prison population projection. As more published projections become available in future, it may be possible to further refine the characterisation of uncertainty and further work continues to be undertaken to update this approach.

The standard deviation at each time point is calculated in the following way:

1. Calculate the percentage difference between the projected and actual populations for each time interval (i.e. difference one month after forecast, two months after forecast etc.) after the forecast date;
2. Create an inverse point for each percentage difference, to ensure a zero mean value, as we assume we are as likely to over-forecast as under-forecast;
3. Calculate the standard deviation of the percentage differences for each time interval from date of projection;

4. Assume error trajectory can be modelled by a (Gaussian) random walk. This assumes the standard deviation profile of this distribution grows with the square root of time after the forecast start;
5. Use this assumption to infer estimates of the standard deviation of errors at each time interval up to the end of the projection period.

This method has been refined since the 2018 projection, to assess performance of all previous projections and thus provide a larger set of data on which to base uncertainty estimates. The unconstrained power function used to model future error trajectory has also been replaced by the random walk (as per step four above), to provide a more indicative model of future behaviour and minimise the prevalence of large swings in uncertainty that resulted from the previous function.

- ## Further information

National Statistics status

National Statistics status means that official statistics meet the highest standards of trustworthiness, quality and public value.

All official statistics should comply with all aspects of the Code of Practice for Official Statistics. They are awarded National Statistics status following an assessment by the Authority's regulatory arm. The Authority considers whether the statistics meet the highest standards of Code compliance, including the value they add to public decisions and debate.

It is the Ministry of Justice's responsibility to maintain compliance with the standards expected for National Statistics. If we become concerned about whether these statistics are still meeting the appropriate standards, we will discuss any concerns with the Authority promptly. National Statistics status can be removed at any point when the highest standards are not maintained, and reinstated when standards are restored.

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URL: www.gov.uk/government/statistics/prison-population-projections-ns

Alternative formats are available on request from ESD@justice.gov.uk