



Ministry of  
**JUSTICE**



# **Prison Population Projections 2009-2015 England and Wales**

Ministry of Justice  
Statistics bulletin

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## Key points

- This bulletin presents projections of the prison population in England and Wales from August 2009 to June 2015. The projections are based on assumptions about future criminal justice trends (e.g. sentencing) and incorporate the anticipated impacts of selected policy and process initiatives.
- These projections represent a partial update of those published in September 2008, and consequently the period over which the projections are made has not been extended beyond June 2015. Any changes from the figures produced last year are due to the influence of observed populations between August 2008 and July 2009<sup>1</sup> on the forward projections produced by the Short Term Prison Projection model, and rebaselining the Long Term Projection Model to start projections from July 2009. All assumptions and anticipated impacts have remained unchanged.
- Three scenarios (High, Medium and Low) have been projected based on assumptions about future sentencing trends. The Medium scenario assumes no increases or decreases in custody rates or determinate sentence lengths. The High/Low scenarios reflect a 1% per annum increase/decrease in custody rates and a 0.5% per annum increase/decrease in the average (determinate) custodial sentence lengths. Other impacts included in the projections, such as those of legislation and processes, are applied equally to all scenarios.
- Projected prison populations for the three scenarios are given in Table 1. By the end of June 2015 the demand for prison spaces is projected to increase to between 83,300 and 93,900.

**Table 1: Projected prison population (end June figures)**

Year	High	Medium	Low
2010	85,700	84,900	83,900
2011	88,600	86,900	84,900
2012	90,200	87,700	84,900
2013	91,100	87,600	84,000
2014	92,400	88,000	83,500
2015	93,900	88,700	83,300

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<sup>1</sup> Actual population figures quoted throughout this bulletin for months prior to July 2009 are taken from monthly published population in custody figures: [www.justice.gov.uk/publications/populationincustody.htm](http://www.justice.gov.uk/publications/populationincustody.htm). The July 2009 prison population figure is a provisional figure published on the 31 July 2009 by HM Prison Service: [www.hmprisonservice.gov.uk/assets/documents/1000481131072009\\_web\\_report.doc](http://www.hmprisonservice.gov.uk/assets/documents/1000481131072009_web_report.doc)

- The assumptions informing the projection, and therefore the projections themselves, are subject to considerable uncertainty. This is represented by the three scenarios, with each scenario being only as likely as the assumptions that inform it. While these assumptions are based on extensive consultation, and emerging data on them are being monitored, the department does not know yet which one is most likely to occur in future. They do not include impacts for any future measures for which implementation timetables were not known at the time of the September 2008 projections (although no major changes in criminal justice policies/processes affecting the prison population have arisen since then), or measures for which the effect cannot be projected with reasonable confidence.

## 1. Introduction

This bulletin presents prison population projections for England and Wales from August 2009 to June 2015. The projections are produced to aid policy development, capacity planning and resource bidding and allocation within the Criminal Justice System (CJS) and the National Offender Management Service (NOMS).

Three possible future scenarios (High, Medium and Low) are presented that have been agreed through cross-CJS stakeholder consultation. These scenarios take into account a number of drivers, including:

- views of future sentencing trends, i.e. changes in custody rates<sup>2</sup>, average custodial sentence lengths (ACSLs) for determinate sentences and tariffs for indeterminate sentences;
- impacts of measures introduced by the Criminal Justice and Immigration Act (CJIA) 2008;
- measures to increase offences brought to justice contributing to PSA 24<sup>3</sup> resulting from crime trends, police detections and arrest activities;
- impacts of Simple, Speedy, Summary Justice (CJSSS) influencing the speed of trials at the courts;
- other legislative, CJS process, and administrative measures that have a bearing on the levels and trends of the prison population, such as new motoring offences<sup>4</sup>.

This year's projections are a partial update to align with current prison population levels. This is to allow time for redevelopment of the long term model and because there have been no major changes within the CJS affecting the prison population.

The impacts of legislative measures and policies have not been updated from those included in the September 2008 publication, and all had an agreed implementation timetable at that time. No major new criminal justice impacts have been identified as requiring modelling at this stage. Appendix B provides details of the assumptions underlying the projections.

These projections take no account of possible impacts of the recession on crime and the prison population.

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<sup>2</sup> The custody rate is the proportion of those sentenced at court who are given a custodial sentence.

<sup>3</sup> PSA 24 is to deliver a more effective, transparent, and responsive Criminal Justice System for victims and the public.

<sup>4</sup> Causing death by careless, or inconsiderate, driving; causing death by driving: unlicensed, disqualified or uninsured drivers; Road Safety Act 2006, SS20, 21.

The High, Medium and Low projections are produced through an intricate modelling exercise using several models spanning the CJS. Appendix C gives a description of the modelling methodology used to generate the prison population projections.

## 2. Prison population August 2008 to June 2009

The “Story of the prison population 1995 – 2009”<sup>5</sup> - a recent Ministry of Justice publication - addresses the changes in the prison population since 1995. Tougher sentencing and enforcement outcomes and a more serious mix of offence groups coming before the court, have been cited as the two factors that have caused the 66% increase in the prison population over this period. The projections published in 2008 assumed a continuation of this trend, with the Medium projection for the population at 30 June 2009 being 84,300 – a 1.3% rise from 30 June 2008. The observed population at the end of June 2009 was 83,450<sup>6</sup>, 150 above the Low projection and a rise of just 0.3% from June 2008. Although monthly prison populations have fluctuated during this period, they have never exceeded 83,500.

At the end of July 2009 the prison population was on the Low projection produced in 2008, and had been following this projection for the first half of 2009. The Low projection reflects the scenario that custody rates and average custodial sentence lengths<sup>7</sup> (ACSLs) will decrease year-on-year by 1.0% and 0.5% respectively. Given that modelled legislative impacts have behaved as expected, this would suggest that the net impact of changes in custody rates and ACSLs, over the period since the 2008 projections were produced, support the Low scenario. This is consistent with the small fall in custody rates for indictable offences seen in the latest Sentencing Statistics Quarterly Briefs<sup>8</sup> for the last two quarters of 2008.

The use of custody as opposed to other disposal options, and the ACSL are the two major factors that affect the future prison population. Projecting the prison population therefore requires an understanding of how sentencing behaviour changes together with knowledge of how legislative and process changes are likely to influence the prison population in the future. The “Story of the prison population 1995 – 2009” gives an explanation of how these two factors have altered over this period, and lists the key legislative and policy changes that have influenced the prison population to date.

The prison population projections are an important aid for capacity planning, with the latest published useable operational capacity being 85,150<sup>9</sup>.

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<sup>5</sup> [www.justice.gov.uk/publications/docs/story-prison-population.pdf](http://www.justice.gov.uk/publications/docs/story-prison-population.pdf)

<sup>6</sup> Actual prison population and capacity figures given in this section have been rounded to the nearest ten.

<sup>7</sup> Refers to determinate custodial sentence lengths.

<sup>8</sup> [www.justice.gov.uk/publications/sentencingquarterly.htm](http://www.justice.gov.uk/publications/sentencingquarterly.htm)

<sup>9</sup> [www.hmprisonservice.gov.uk/assets/documents/1000484E21082009\\_web\\_report.doc](http://www.hmprisonservice.gov.uk/assets/documents/1000484E21082009_web_report.doc)

### 3. Modelling Methodology and Scenario Assumptions

The 2009-2015 prison population projections represent the outputs of a complex modelling exercise using several models spanning the CJS (see Appendix C). These models use various data sources including sentencing trends; prison receptions, discharges and populations; demographics; crime trend trajectories; and criminal histories of offending by offence type. The models also incorporate upstream constraints within the CJS (e.g. capacity of courts to process cases) and assumptions on how these factors are anticipated to change in the future to construct projections for the demand for prison places.

One of these models – the Long Term Prison Projections model, which in its present form projects populations to June 2015 – is undergoing a major re-development, and the underlying modelling assumptions have not been updated from last year. However, outputs have changed as a consequence of rebaselining the model to start projections from July 2009.

The projections are very sensitive to observed changes in populations, and consequently the projections can be updated by incorporating observed monthly populations between August 2008 and July 2009; these monthly figures have been used to update the Short Term Prison Projections (STPP) Model. This is a trend based model that takes into account the current prison population, distributions of time served, projected number of receptions and projected rates of discharge from those receptions. The model provides end-of-month projections for up to two years, and is described in more detail in Appendix C.

The High, Medium and Low scenarios (see Chart 1) represent three alternative views of the possible future prison population. These assumptions were agreed last year in consultation with key stakeholders including the National Offender Management Service (NOMS), the Parole Board, the Office for Criminal Justice Reform (OCJR), and related Ministry of Justice entities.

The measures included in the scenarios had agreed implementation dates when the 2008-2015 projections were published (see Appendix B), and represented the view of the future by CJS stakeholders. Whilst we have not explicitly adapted these measures based on evidence collected in the last year, any impact would be included in the baseline.

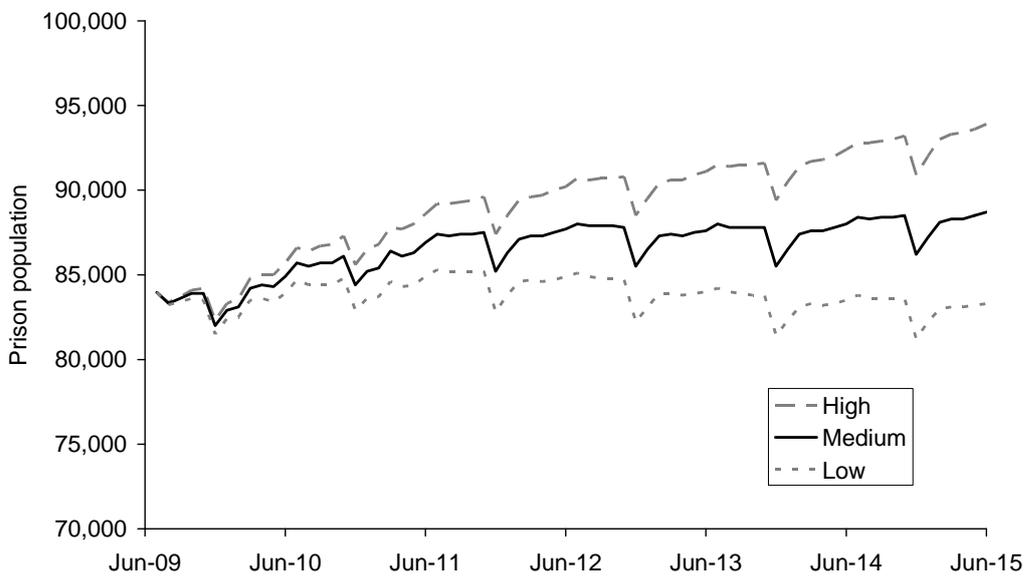
The Criminal Justice and Immigration Act 2008 (CJIA) included a number of measures affecting the prison population. The combined CJIA measures (excluding imprisonment for public protection (IPP) reform) were expected to build to a maximum impact in late 2009, reducing the prison population by 1,600. To date the measures have delivered broadly as expected.

The assumptions underlying the three scenarios include sentencing trend assumptions, legislative impacts and process changes as outlined in Appendix B. Specific legislative and process impacts are equally applied to each scenario. The scenarios represent possible futures based on assumed sentencing trends and the realisation of legislative and procedural changes; they are not predictions of what will happen to the prison population.

## 4. Results

The three scenarios give rise to a projected prison population of between 83,900 and 85,700 by the end of June 2010, between 84,900 and 90,200 by the end of June 2012 and between 83,300 and 93,900 by the end of June 2015 (see Chart 1). Appendix A presents the annual projected end of June populations and average financial year populations from 2010–2015 together with further breakdowns of the projected population by gender and the sub-populations of remand, sentenced and non-criminal categories. Monthly projections for each scenario are also presented in this appendix.

**Chart 1: Projected monthly population (all scenarios)**



As Chart 1 illustrates, the prison population projections increase between 2009 and 2011<sup>10</sup> for all three scenarios. Subsequently, between 2011 and 2012 the Low projection remains level, while the High and Medium projections increase. Between 2012 and 2013 the Medium and Low projections decrease, while the High projection increases. The High and Medium projections then increase to 2015, while the Low projection continues to decrease. These trends reflect the cumulative impacts of the various sentencing, legislative and procedural assumptions that are used to generate the projections.

For the Medium scenario, the custody rate and average custodial sentence length for determinate sentences are assumed to be constant going forward. As such, the change in growth (from current population levels) in this scenario stems from the legislative and process impacts included. The difference between the High, Medium

<sup>10</sup> All year on year comparisons are between end of June figures

and Low scenarios directly reflects the different sentencing trend assumptions used in these scenarios to generate the projections. As this year's projections are only over 6 (rather than the usual 7) years the overall impact of sentence trend scenarios over the period of the projections will be less this year than when the projections were published in 2008.

**Chart 2: Comparing 2008 and 2009 projections (July 2008 – June 2011)**

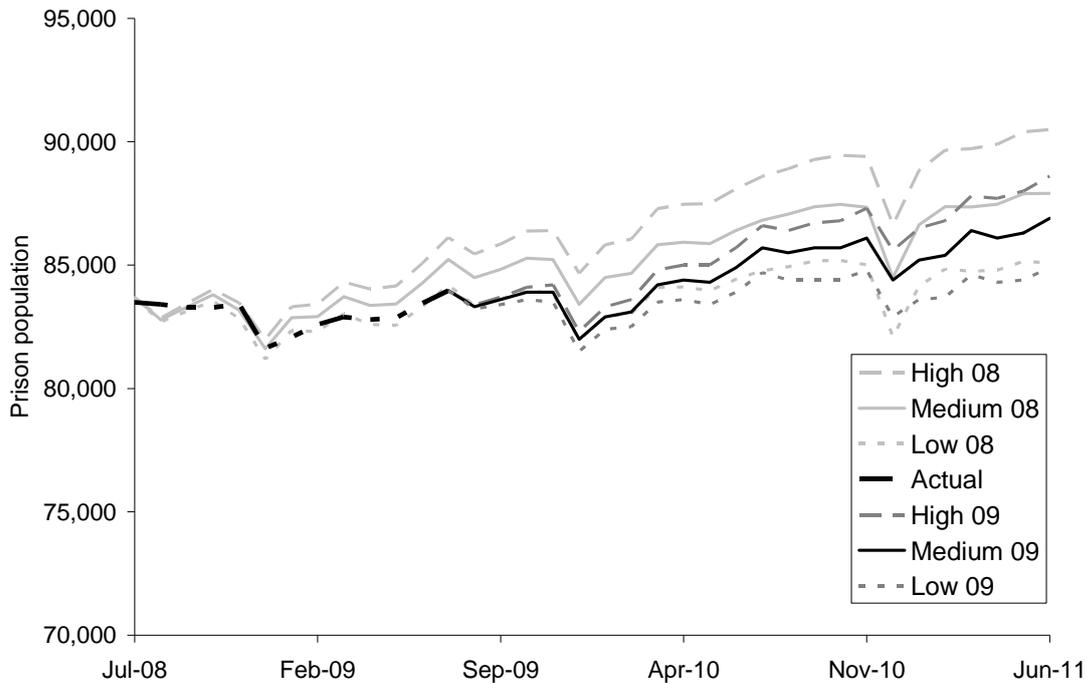


Chart 2 plots the three scenarios produced in 2008 for the period July 2008 to June 2011. The actual population figures from July 2008 are also plotted, along with the three scenarios produced this year, which project from the July 2009 actual figure.

Chart 2 shows that the prison population has been tracking the Low 2008 projection in the first 7 months of 2008, and consequently the starting point for the 2009 projections is approximately on the Low 2008 projection. The underlying assumptions on which the three scenarios are based have not changed from last year, and as a result of this the expected trends to 2015 have remained relatively unchanged. Therefore, the effect of moving the start point of the projections forward one year, and starting on the Low 2008 projection, is that the High and Medium projections have decreased for year on year comparisons, whereas the Low projection has remain relatively unchanged. A comparison of end of June figures from the 2008 and 2009 projections can be found in Appendix A.

## 5. Caveats on Modelling the Prison Population

The prison population is influenced by diverse factors that can mean that the actual future prison population may not be the same as that projected:

- changes in sentencer behaviour, policy decisions and the criminal justice process, which can respond to a multitude of environmental factors such as high profile criminal cases and public debate;
- implementation of new policies and processes without a timetable, or for which a quantitative assessment of the impact is currently not possible;
- unknown future policy, process and political changes.

The assumptions underlying these projections were captured through a consultative process that included all major stakeholders in 2008. The assumptions are based on analysis (where reliable data are available) and 'expert judgment' 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 those that do not.

The projections can fluctuate between  $\pm 2\%$  and  $\pm 3\%$  of estimated figures due to statistical modelling variation. The margins of error on any 'expert judgment' assumptions cannot be computed and will add to this variation.

## Appendix A: Additional Tables

**Table A1: Tables of overall projected prison population<sup>1</sup>**

Projected prison population (at the end of June)

Year	High	Medium	Low
2010	85,700	84,900	83,900
2011	88,600	86,900	84,900
2012	90,200	87,700	84,900
2013	91,100	87,600	84,000
2014	92,400	88,000	83,500
2015	93,900	88,700	83,300

Average projected prison population (financial year)

Year	High	Medium	Low
2010/11	86,400	85,300	84,000
2011/12	88,800	86,900	84,600
2012/13	90,200	87,400	84,300
2013/14	91,100	87,400	83,500
2014/15	92,500	87,900	83,100

Comparison of 2008 and 2009 projections (all end of June figures)

Year	High			Medium			Low		
	2008 projection	2009 projection	Difference	2008 projection	2009 projection	Difference	2008 projection	2009 projection	Difference
2009	85,100	83,454	-1.9%	84,300	83,454	-1.0%	83,300	83,454	0%
2010	88,100	85,700	-2.7%	86,400	84,900	-1.7%	84,400	83,900	-1%
2011	90,500	88,600	-2.1%	87,900	86,900	-1.1%	85,100	84,900	0%
2012	92,100	90,200	-2.1%	88,700	87,700	-1.1%	85,000	84,900	0%
2013	93,000	91,100	-2.0%	88,600	87,600	-1.1%	84,100	84,000	0%
2014	94,200	92,400	-1.9%	89,000	88,000	-1.1%	83,600	83,500	0%
2015	95,800	93,900	-2.0%	89,700	88,700	-1.1%	83,400	83,300	0%

Note: 2009 projection figures for 2009 are actual June population figures

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<sup>1</sup> All projected figures are rounded to the nearest hundred.

**Table A2: Breakdown of projected prison population for High, Medium and Low scenarios**

High scenario										
	Remand			Sentenced			Non-criminal Total	Total		
	Male	Female	Total	Male	Female	Total		Male	Female	Total
2009	12,617	839	13,456	65,092	3,396	68,488	1,510	79,158	4,296	83,454
2010	12,300	800	13,100	67,600	3,500	71,000	1,500	81,300	4,400	85,700
2011	12,400	900	13,300	70,200	3,600	73,800	1,500	84,100	4,600	88,600
2012	12,500	900	13,300	71,700	3,700	75,400	1,500	85,600	4,600	90,200
2013	12,500	900	13,400	72,400	3,800	76,200	1,500	86,400	4,700	91,100
2014	12,600	900	13,400	73,600	3,800	77,400	1,500	87,600	4,700	92,400
2015	12,600	900	13,500	75,000	3,900	78,900	1,500	89,100	4,800	93,900

Medium scenario										
	Remand			Sentenced			Non-criminal Total	Total		
	Male	Female	Total	Male	Female	Total		Male	Female	Total
2009	12,617	839	13,456	65,092	3,396	68,488	1,510	79,158	4,296	83,454
2010	12,200	800	13,000	66,900	3,400	70,300	1,500	80,600	4,300	84,900
2011	12,200	800	13,100	68,800	3,500	72,400	1,500	82,500	4,400	86,900
2012	12,200	800	13,000	69,600	3,600	73,100	1,500	83,200	4,500	87,700
2013	12,200	800	13,000	69,600	3,600	73,100	1,500	83,200	4,400	87,600
2014	12,200	800	13,000	70,000	3,600	73,500	1,500	83,600	4,400	88,000
2015	12,100	800	13,000	70,600	3,600	74,200	1,500	84,200	4,500	88,700

Low scenario										
	Remand			Sentenced			Non-criminal Total	Total		
	Male	Female	Total	Male	Female	Total		Male	Female	Total
2009	12,617	839	13,456	65,092	3,396	68,488	1,510	79,158	4,296	83,454
2010	12,100	800	12,900	66,200	3,300	69,500	1,500	79,700	4,200	83,900
2011	12,100	800	12,900	67,300	3,300	70,600	1,500	80,800	4,100	84,900
2012	12,000	800	12,800	67,300	3,200	70,600	1,500	80,800	4,100	84,900
2013	11,900	800	12,700	66,600	3,200	69,800	1,500	79,900	4,000	84,000
2014	11,800	800	12,600	66,200	3,100	69,400	1,500	79,500	4,000	83,500
2015	11,800	800	12,500	66,100	3,100	69,300	1,500	79,300	4,000	83,300

Notes: Data are given for the end of June in each year. Figures for 2009 are actual data. All other figures are rounded to the nearest hundred. Components may not sum due to rounding.

**Table A3: Monthly values of projected prison population for High, Medium and Low scenarios**

	High	Medium	Low		High	Medium	Low
Jul 2009	83,962	83,962	83,962	Jul 2012	90,700	88,000	85,100
Aug 2009	83,400	83,300	83,200	Aug 2012	90,600	87,900	84,900
Sep 2009	83,700	83,600	83,400	Sep 2012	90,700	87,900	84,800
Oct 2009	84,100	83,900	83,600	Oct 2012	90,700	87,900	84,800
Nov 2009	84,200	83,900	83,500	Nov 2012	90,800	87,800	84,700
Dec 2009	82,300	82,000	81,500	Dec 2012	88,500	85,500	82,200
Jan 2010	83,300	82,900	82,400	Jan 2013	89,500	86,500	83,100
Feb 2010	83,600	83,100	82,500	Feb 2013	90,400	87,300	83,900
Mar 2010	84,800	84,200	83,500	Mar 2013	90,600	87,400	83,900
Apr 2010	85,000	84,400	83,600	Apr 2013	90,600	87,300	83,800
May 2010	85,000	84,300	83,400	May 2013	90,900	87,500	83,900
Jun 2010	85,700	84,900	83,900	Jun 2013	91,100	87,600	84,000
Jul 2010	86,600	85,700	84,700	Jul 2013	91,500	88,000	84,200
Aug 2010	86,400	85,500	84,400	Aug 2013	91,400	87,800	84,000
Sep 2010	86,700	85,700	84,400	Sep 2013	91,500	87,800	83,900
Oct 2010	86,800	85,700	84,400	Oct 2013	91,500	87,800	83,800
Nov 2010	87,300	86,100	84,800	Nov 2013	91,600	87,800	83,800
Dec 2010	85,600	84,400	82,900	Dec 2013	89,400	85,500	81,400
Jan 2011	86,500	85,200	83,600	Jan 2014	90,500	86,500	82,300
Feb 2011	86,800	85,400	83,700	Feb 2014	91,400	87,400	83,100
Mar 2011	87,800	86,400	84,600	Mar 2014	91,700	87,600	83,300
Apr 2011	87,700	86,100	84,300	Apr 2014	91,800	87,600	83,200
May 2011	88,000	86,300	84,400	May 2014	92,000	87,800	83,300
Jun 2011	88,600	86,900	84,900	Jun 2014	92,400	88,000	83,500
Jul 2011	89,200	87,400	85,300	Jul 2014	92,800	88,400	83,800
Aug 2011	89,200	87,300	85,200	Aug 2014	92,800	88,300	83,600
Sep 2011	89,300	87,400	85,200	Sep 2014	92,900	88,400	83,600
Oct 2011	89,400	87,400	85,200	Oct 2014	93,000	88,400	83,600
Nov 2011	89,600	87,500	85,200	Nov 2014	93,200	88,500	83,600
Dec 2011	87,400	85,200	82,800	Dec 2014	90,900	86,200	81,200
Jan 2012	88,500	86,300	83,800	Jan 2015	92,000	87,200	82,200
Feb 2012	89,400	87,100	84,600	Feb 2015	93,000	88,100	83,000
Mar 2012	89,600	87,300	84,700	Mar 2015	93,300	88,300	83,100
Apr 2012	89,700	87,300	84,600	Apr 2015	93,400	88,300	83,100
May 2012	90,000	87,500	84,700	May 2015	93,600	88,500	83,200
Jun 2012	90,200	87,700	84,900	Jun 2015	93,900	88,700	83,300

Notes: Figures for July 2009 are provisional HM Prison Service population data. Other data are rounded to the nearest hundred.

## Appendix B: Stakeholder Assumptions

### B1. Sentencing trends and scenarios

The sentencing trend assumptions reflect the underlying year-on-year percentage changes in custody rates and average custodial sentence lengths. Three scenarios are used (High, Medium and Low):

- The Medium Scenario assumes that both custody rates and average sentence lengths remain unchanged, i.e., there is no year-on-year change in custody rates and average custodial sentence length throughout the whole period (2009 to 2015).
- The High Scenario assumes that there will be a year-on-year increase in custody rates of 1% and a year-on-year increase in average custodial sentence lengths of 0.5%.
- The Low Scenario assumes that there will be a year-on-year decrease in custody rates of 1% and a year-on-year decrease in average custodial sentence lengths of 0.5%.

These assumptions hold for each of the gender and offence groups used in generating the prison population projections.

### B2. Legislative and procedural assumptions

The legislative and procedural assumptions incorporated into these projections apply to legislation which either had a fixed implementation date when projections were published in 2008, or were already implemented but the effect on the prison population was yet to be fully realised. There have been no major criminal justice changes since then that we would have wanted to account for in the projections.

#### **Criminal Justice Act 2003**

Assumptions on length of stay of IPP sentences are set out in Table B1.

**Table B1: Assumptions of time served for IPP offenders**

	IPPs pre-CJIA 2008	IPPs post-CJIA 2008
Average number of receptions per month	140	45
Average tariff (months)	38	60
Average time served post tariff (months)	54	54
Average time on community supervision (months)	120	120
Breach rate (% of those under supervision in the community per year)	14	14

### **Criminal Justice and Immigration Act 2008**

The Criminal Justice and Immigration Act 2008 introduced a number of measures which are expected to have the effect of reducing the prison population. These measures include:

- the presumption of a 28 day fixed-term recall for breach of licence (rather than recall until the end of sentence or release by the Parole Board);
- restricting the grounds on which a person charged with an imprisonable summary offence or a relevant low-level criminal damage offence may be refused bail;
- allowing those who have spent some of their time on remand on tagged curfew to have part of this time credited against the amount of time served in custody;
- treating some prisoners sentenced under the Criminal Justice Act 1991 as if they were sentenced under the Criminal Justice Act 2003 (with the effect of them becoming eligible for automatic release at the halfway, rather than two-thirds, point of their sentence).

These measures were commenced at various points between mid and late 2008 and calculations of the total magnitude relied on assumptions about future behaviour of the CJS. These resulted in the measures (excluding IPP reform) giving a maximum effect of around 1,600 prison places in late 2009; this subsequently drops to around 1,300 for the rest of the projection period. (While most of the measures will result in a steady build up of extra places, the effect of converting Criminal Justice Act 1991 cases has its largest impact twelve months after it is put into effect; after this point, its effect on the prison population slowly falls, as there will be fewer offenders sentenced under the Criminal Justice Act 1991 for it to affect.)

### **Criminal Justice System – Simple, Speedy, Summary Justice (CJSSS)**

CJSSS assumptions have been agreed through a separate consultation carried out by the Office for Criminal Justice Reform (OCJR) and are assumed to be implemented in April 2008. CJSSS assumptions included in these projections were those agreed in April 2007.

- Number of pre-trial reviews and hearings reduced to two in magistrates' courts and Crown courts.
- More early guilty pleas: 10% of late guilty pleas changed to early guilty pleas in the magistrates' courts.

### **Initiatives to bring more offences to justice (PSA 24)**

The continued implementation of measures to bring more offences to justice requires assumptions on future crime trends and sanctioned detection rates.

Sanctioned detection rates (including charges, summons and cautions) for violence, sexual offences, burglary and robbery are assumed to increase by one third of a percent per year through the projection period while the remaining sanctioned detection rates are assumed to remain constant.

Crime trends are taken from v06.00 of the Crime Trajectory Model.

### **End of Custody Licence (ECL)**

End of Custody Licence (ECL) was introduced on 29<sup>th</sup> June 2007. Because there is no agreed timetable for its conclusion, its effect is included throughout the projection period. It reduces the prison population by around 1,300 places while it is operational.

### **UKBA policies and legislation**

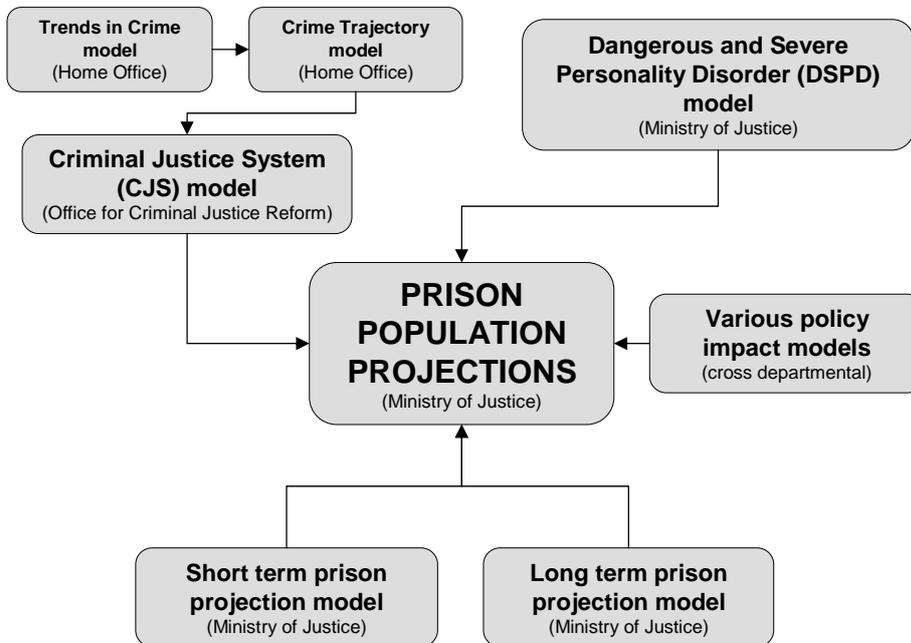
No specific legislation included in projections. It has been assumed that the number of non-criminal prisoners will remain constant at around 1,500.

## Appendix C: Models, model specific assumptions, and modelling caveats

### C1. Overview of the modelling approach

The outputs of four models – the Short Term Prison Projections (STPP), Long Term Prison Projections (LTPP), Dangerous and Severe Personality Disorder (DSPD) and Criminal Justice System (CJS) models – have been used to generate the 2009–2015 prison population projections (see Figure C1). This appendix presents an overview of these models and demonstrates how the model outputs have been combined to create the final prison population projections.

**Figure C1: Prison projections modelling system**



All data used in the modelling of the prison projection is anonymised, thus complying with Ministry of Justice procedures to protect confidential information, and the requirements of the UK Statistics Authority Code of Practice.

## C2. Short Term Prison Projections model

Monthly prison population projections from June 2009 to June 2011 are generated using the Short Term Prison Projections (STPP) Model. This is a trend-based model that takes into account the current prison population, distributions of time served, projected numbers of receptions and projected rates of discharge from those receptions. The model provides end of month projections for up to two years ahead.

Within the STPP model the prison population is subdivided into 44 subpopulations based on the following criteria<sup>2</sup>:

- Custody type (Remand, Sentenced, Recall and Non-criminal)
- Gender (Male and Female)
- Age (Under 21, 21 to 24, 25 and over)
- Sentence length (Less than 6 months, 6 months to less than 1 year, 1 year to less than 4 years, 4 years to less than life, Life sentences, Indeterminate sentences for Public Protection (IPP))

The total prison population projection represents the sum of the individual population segment projections.

Three methodologies are used within the STPP model to generate the projections:

### Receptions/Discharge Distributions Method

This methodology is based on measuring the difference between the inflow (receptions) and outflow (discharges) from prisons each month to assess the net change in the prison population through time. It uses an X-12 ARIMA time series approach<sup>3</sup> to generate reception projections from historic data. In turn, historic time-served distributions are used to estimate future monthly outflows. The difference between inflows and outflows through time gives the net change in the prison population. This approach is suitable for population segments where complete historic time-served distributions are available (e.g. those with relatively short custodial sentences).

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<sup>2</sup> Not all combinations are possible. For example sentence length bands are not applicable to the remand population.

<sup>3</sup> X-12 ARIMA is a seasonal adjustment program that generates forecasts from monthly time series data. It has been developed by the US Census Bureau and is approved for government use by the Office for National Statistics. Further information can be found at [www.census.gov/srd/www/x12a](http://www.census.gov/srd/www/x12a)

### **Population X-12 ARIMA Method**

This method is based on predicting the future population based on historic population data. It uses an X-12 ARIMA time series approach to generate projections. This approach has been adopted where time-served distribution information is incomplete. This makes it a more suitable approach for population segments with longer custodial sentences (4 years or more).

### **User Defined Method**

For a small number of sub-populations neither the Receptions/Discharge Distributions method nor the Populations ARIMA method is satisfactory owing to a lack of suitable historic time series data. In such cases population projections have been defined outside the STPP model in collaboration with stakeholders.

For the 2009-2015 prison population projections user profiles have been used for:

- **Non-criminals** – Prison populations are small and have historically been volatile. In consultation with stakeholders it was assumed the non-criminal population will remain unchanged at around 1,500 per month throughout the period of the projections.
- **Indeterminate sentences, such as IPPs and Life sentences** – No reliable data are currently available for IPP discharges as this sub-population has only existed for four years and very few have been discharged. IPP projections have therefore been taken from the DSPD model, which has been designed specifically to model this sub-population (see Section C4). Life sentences have also been taken from the DSPD model, as these projections are considered more robust than those generated using the Populations X-12 ARIMA method.

The STPP model projections do not explicitly incorporate assumptions about custody rate trends and sentencing trends. However, with the Receptions/Discharge Distribution method and the Population ARIMA method historic trends in sentencing behaviour are used to build projections. Therefore the short-term projections may be considered to incorporate implicitly recent trends in sentencing.

**Table C1: Overview of the modelling methodologies used in the STPP model by prison population segment**

Receptions/Discharge Distributions Methodology	Population ARIMA Methodology	User Defined Profiles
Recalled prisoners	Prisoners sentenced to determinate sentences of four years or more	IPP prisoners (From DSPD model <sup>4</sup> )
Remand prisoners		Life sentence prisoners (From DSPD model <sup>4</sup> )
Prisoners sentenced to less than four years		Non Criminals

### C3. Long-Term Prison Projections model

A major development of the long-term prison population projections (LTPP) model is being undertaken in 2009 – 10.

The existing long-term prison population projections (LTPP) model produces projections of the annual prison populations of England and Wales segmented by sex and sentenced and remand categories. From the numbers born each year since 1928<sup>5</sup>, it estimates the number of first-time offenders sentenced each year since 1965. Similarly, it estimates the number of those released from prison that re-offend and are sentenced (and when they are sentenced). Using known historical custody rates, custodial sentence lengths, and the sentencing trend assumptions for the future, each quarter the newly sentenced prisoners are added to the prison population. Those that have come to the end of their sentences are subtracted.

This model has been used to generate three future scenarios (High, Medium and Low) by changing the custody rates and average custodial sentence lengths (see Appendix B). These annual projections have been converted into monthly projections by interpolating between June estimates and applying seasonal factors calculated using the X-12 ARIMA program for sentenced and remand, male and female populations.

However, in line with the Ministry of Justice's ambition of becoming a leader in the use of evidence-based analysis, the decision has been made to further develop the LTPP model. The methodology of the updated LTPP model will represent a

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<sup>4</sup> The DSPD model projects total numbers of offenders with IPP and life sentences who are held in the prison estate. The STPP model has been used to apportion these projections by gender and age groups.

<sup>5</sup> Demographic information for live births is taken from the Office for National Statistics data.

development of the original “flow” model upon which the existing LTPP model is based. A system dynamics framework will be used to formalize the theory underpinning the model, and re-validation of this theory will be undertaken as necessary. The underlying data used in the LTPP model will also be completely refreshed, based on extracts from the Police National Computer database held by the Ministry.

This development process is also providing the opportunity for stakeholders (both internal and external) to influence the way in which the LTPP model is developed. Internal stakeholder needs were taken into consideration when planning this project and they will be involved in steering the project. For external stakeholders, an announcement of plans to update the LTPP model was made on the Ministry website. A link is provided ([here](#)) to enable interested parties to comment, or ask for further details. In this way, the redeveloped LTPP model should meet the requirements of all users, whilst providing the most accurate projections possible, thus ensuring efficiency and value-for-money for the Ministry.

The LTPP projections are National Statistics produced in accordance with the United Kingdom Statistical Authority’s (UKSA) code of practice. The UKSA has recently assessed the projections against their code of practice<sup>6</sup> and confirmed them as National Statistics subject to the implementation of some general enhancements affecting all Ministry statistics which have now been implemented or will be shortly. The modelling itself is covered by the quality assurance process under development by the Ministry of Justice Operational Research (MoJOR) Community. Until the LTPP model development process is complete, updates will be of the short-term (STPP) model; the underlying data for the LTPP model will not be updated from when the results were published in 2008.

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<sup>6</sup> [www.statisticsauthority.gov.uk/assessment/assessment-reports/assessment-report-7---prison-population-projections---27-july-2009.pdf](http://www.statisticsauthority.gov.uk/assessment/assessment-reports/assessment-report-7---prison-population-projections---27-july-2009.pdf)

## **C4. Combining the STPP, LTPP, DSPD and CJS model projections**

Outputs from the Dangerous and Severe Personality Disorder Model (DSPD) are used to estimate populations for the segments that are not adequately modelled by the STPP model (see Table C1), and the Criminal Justice System (CJS) model is designed to assess the impact of certain policy initiatives on the Criminal Justice System of England and Wales. Further details of these models can be found in Appendix C of the Prison Population Projections 2008-2015<sup>7</sup> bulletin. An assessment of modelling uncertainties and caveats can also be found here; re-assessment of these uncertainties was unnecessary given that the projections have only been partially updated.

To generate the final prison population projections, selected outputs from the STPP, LTPP, DSPD and CJS models have been combined as follows:

### **Normalising the short-term projections**

For the first two years of the prison population projections (2009-2011) the STPP model has been used to project the remand, recall (excluding IPPs) and determinate sentenced populations including EPPs. The DSPD model has been used to estimate the IPP recall and IPP sentenced populations. Due to slight differences in the datasets upon which the STPP and DSPD models are based and published prison population data, the combined results have been normalised to align them with published provisional prison population data for July 2009. This correction is small (2.0%) and does not affect the projected trends.

### **Aligning the short-term and long-term results**

For the final four years of the prison population projections (2011-2015) the LTPP model has been used to project the remand, recall and sentenced populations excluding IPPs. The DSPD model has been used to estimate the IPP (sentenced plus recalls) and EPP populations. The combined long-term results for the Medium scenario have been adjusted to match the June 2011 normalised short-term results. This assumes the short-term projections are more accurate than the long-term projections in the short-to-medium term and preserves trends from the LTPP projections in the long term.

The same adjustment factor is applied to the High, Medium and Low scenario from the LTPP projections for July 2011 onwards. Prior to this date, the short-term projections have been realigned to meet the High and Low scenarios assuming that sentencing behaviour changes at a constant rate over the two-year period for which the short-term model is used. The LTPP model has been rebaselined so that changes in sentencing trends are modelled from a common starting point at July 2009.

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<sup>7</sup> [www.justice.gov.uk/publications/docs/stats-prison-pop-sep08.pdf](http://www.justice.gov.uk/publications/docs/stats-prison-pop-sep08.pdf)

### **Incorporating the impact of legislation**

The combined short- and long-term projections represent the baseline case without the impact of legislative and/or operational changes that have yet to affect demand for prison places. The anticipated impacts of policy changes with known implementation timetables have therefore been summed to this baseline to generate the final prison population projections as follows:

- Outputs of the CJS model: the net impact of the continuing implementation of measures to bring more offences to justice (PSA 24) and the CJSSS programme have been taken from the CJS model and added to the baseline projections.
- Additional legislative impacts: the net impact of the Criminal Justice and Immigration Act 2008 (excluding the effects on IPPs and EPPs) and changes in the death by careless driving legislation have been individually calculated in consultation with stakeholders and factored into the baseline (see Appendix B for the underlying assumptions).

Legislative impacts have been assigned to the High, Low and Medium scenarios equally.

## Explanatory notes

1. This is a National Statistics publication produced by the Ministry of Justice. National Statistics are produced to high professional standards set out in the Code of Practice for Official Statistics and the prison population projections have been recently assessed by the United Kingdom Statistics Authority against the Code of Practice and confirmed as National Statistics. They undergo regular quality assurance reviews to ensure that they meet customer needs. They are produced free from any political interference.
2. The Ministry of Justice has published its statement of compliance with Pre-release Access Order 2008 and its policy statement on revisions on the Ministry website.
3. Revisions to the projections: each set of projections is normally a complete revision of previous projections, covering a new period and using new baseline data and assumptions. If errors are discovered in a calculated projection a correction will be published as soon as possible unless the change is minor. As mentioned elsewhere we are currently consulting on revisions to the methodology.

### Contact points for further information

Current and previous editions of this publication are available for download at [www.justice.gov.uk/publications/prisonpopulation.htm](http://www.justice.gov.uk/publications/prisonpopulation.htm)

Spreadsheet files of the tables contained in this document are also available for download from this address.

Press enquiries should be directed to the Ministry of Justice press office:

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Other enquiries about these statistics should be directed to:

Ministry of Justice  
Offender Management and Sentencing – Analytical Services  
7th Floor, 102 Petty France  
London, SW1H 9AJ

We welcome the views of users on the format and timing of reports, as well as on the quality of the projections. These views, and other general enquiries about the statistical work of the Ministry of Justice can be emailed to: [statistics.enquiries@justice.gsi.gov.uk](mailto:statistics.enquiries@justice.gsi.gov.uk)

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