

## Height and Colonial Offending

Those who end up before the courts are likely to be shorter than the mean height for their age and sex. Some have speculated that this is because short individuals find it more difficult to find work and hence are more likely to be driven to crime.<sup>1</sup> This is a phenomenon that could be explained by class differences. In most societies those born into affluent homes are on average taller than those who experience childhood disadvantage. Stature can reflect social inequalities since the conditions encountered in utero and during formative growing years dictate the extent to which an individual will be able to reach their biologically programmed height.<sup>2</sup> One way of looking at this is to argue that childhood neglect can have life long consequences. This is not to imply that criminals are “born bad”—this is not a question of genetic inheritance—but that the disadvantage associated with being short is more likely to see an individual end up in a court room at some later point in their life.

This is a complex issue. While it is possible that foetal and childhood stunting might directly impact upon the propensity for an individual to offend later in their life course, diminished stature may merely be a marker for other factors. Thus, poor infant nutrition might well impair cognitive ability leading to life of poor decision-making.<sup>3</sup> Alternatively, any person born into a community characterised by inadequate access to nutrition and heightened risk of infection is likely to be disadvantaged in other ways too—restricted access to education springs to mind. In this sense those who end up in the courts may be poorly educated, not because they are short, but because educational disadvantage is also associated with being shorter than the population mean.

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<sup>1</sup> Howard Bodenhorn, Carolyn Moehling and Gregory N. Price, ‘Short Criminals: Stature and Crime in Early America’, *Journal of Law and Economics*, 55, 2 (2012), 416.

<sup>2</sup> Roderick Floud, Kenneth Wachter and Annabel Gregory, *Height, Health and History: Nutritional Status in the United Kingdom, 1750-1980* (Cambridge University Press, Cambridge, 1990), 9-20.

<sup>3</sup> Anne Case and Christina Paxson, ‘Height, Health and Cognitive Function at Older Ages’, *American Economic Review*, 90 (2008), 463-7.

It is possible that heavy policing of disadvantaged areas could lead to similar effects—a reminder, if we needed one, that court appearances do not necessarily tell us much about underlying offending rates<sup>4</sup>. If police resources were disproportionately used to target poor suburbs, it is hardly surprising that the average height of those in the dock was less than those who sat in judgement over them. We could extend the parallel. Just as there is evidence to suggest that short people are at a disadvantage in job interviews, it is likely that the same applies with their interactions with the police and the judicial establishment. As stature is linked to class it is possible that offenders who are taller than average are more likely to find themselves the beneficiaries of decisions not to prosecute than others who lack an air of respectability that height might confer. As the economist John Kenneth Galbraith once put it, the favouritism bestowed on the tall is one of societies ‘most blatant and forgiven prejudices’.<sup>5</sup>

Historical height measurements can offer insights into shifts in the conditions confronting families over time. Unlike environmental insults, the distribution of genes that govern an individual’s potential height are not skewed by class factors. As the Belgian mathematician Adolphe Quetelet discovered in the first half of the nineteenth century, the distribution of heights within a population with a shared genetic inheritance is shaped like a bell.<sup>6</sup> That is, there is a similar number of short individuals as there are tall. For this reason fluctuations in mean adult height between birth cohorts are more likely to reflect changes in conditions encountered in utero and during the early years of life than genetic causes. The important point being that the distribution of genes is class blind, whereas environmental stunting is not.

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<sup>4</sup> Barry Godfrey, Paul Lawrence and Chris A. Williams, *History and Crime* (Sage, London, 2008), 25-50.

<sup>5</sup> Isaac B. Rosenberg, ‘Height Discrimination in Employment’, *Utah Law Review*, 3 (2009), 908

<sup>6</sup> Garabed Eknoyan, ‘Adolphe Quetelet (1796–1874)—the average man and indices of obesity’, *Nephrology Dialysis Transplantation*, 23, 1 (2008), 47-51.

Such effects might include deterioration in the quantity and quality of diet. When household budgets are squeezed families are likely to substitute cheaper carbohydrates for protein.<sup>7</sup> The reverse will happen when household incomes increase. Families facing straightened circumstances may also make decisions about the distributions of scarce resources, choosing to protect the diet of male breadwinners at the expense of women and children. Thus, the impact of belt tightening may fall on the weakest—as opposed to the strongest member of the household unit—despite the fact that the latter is usually the greatest consumer of calories.<sup>8</sup>

It is not nutrition *per se* that impacts upon growth, but nutrition net of the claims made on the body by activity, disease and other environmental stresses. It is perhaps useful to see this as an equation. On the one hand bodies receive energy in the form of food, on the other work, sickness and other abuses all claim a share of that energy. We consume calories even when we sleep. The more active we are, and the greater the overall demands placed on the body, the more we need to consume in order not to starve.<sup>9</sup>

Nutrition and disease can interact in powerful ways. Poor diets will weaken immune systems increasing the risk of infection. This combined effect is called a synergistic action, as neither under-nutrition nor disease impact upon human growth with such force on their own as they do in combination.<sup>10</sup> Respiratory and other infections that lead to inflammatory responses can make particular demands on growing bodies. While such responses work in terms of short-term survival, they

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<sup>7</sup> John A. L. Cranfield, Thomas W. Hertel James S. Eales, and Paul V. Preckel, 'Changes in the Structure of Global Food Demand', *GTAP Working Paper*, 1 (1988), 1.

<sup>8</sup> Sara Horrell, David Meredith and Deborah Oxley, 'Measuring Misery: Body Mass, Ageing and Gender inequality in Victorian London. *Explorations in Economic History*, 46 (2009), 93–119.

<sup>9</sup> Richard H. Steckel, 'Heights and Human Welfare: Recent Developments and New Directions', *Explorations in Economic History*, 46, 1 (2009), 1-23

<sup>10</sup> Barry Bogin, *Patterns of Human Growth* (Cambridge University Press, Cambridge, 1999), 276

divert energy from growth—diminishing adult stature.<sup>11</sup> The survivors of childhood disease can thus be marked by the experience. In the same way that smallpox can leave a tell tale trail across the skin of those it does not kill, childhood disease can slow growth trajectories and prevent the survivors from standing as tall in adult life as they would have done if their infant years had not been blighted.<sup>12</sup>

The height of past populations can thus tell historians much about the conditions that individuals encountered in their formative years. Given sufficient data it is possible to glimpse inside households in order to piece together a history of the impact that declining wages, rising prices, improvements in sanitation and diminishing family size had on mean adult stature. The attraction of height data is that it holds out the possibility of reconstructing the private life of the family at the aggregate level.

There is a problem however. While states have measured many individuals in the past, they have done so for particular reasons. By the middle of the nineteenth century it was common to record the heights of convicted criminals as an aid to identifying recidivists and escapees. Those who spend time inside are not necessarily representative of the population as a whole however. The issue of the short prisoner exemplifies the problem—historically those who have found themselves on the wrong side of a cell door have tended to be shorter than the population mean.<sup>13</sup> Yet this need not be a serious distorting factor if the composition of the inmate population remains consistent over time. Thus, while it might be true that prisoners tend to be short, fluctuations in the height of inmates born in successive years might still reflect changing environmental and social conditions confronting a population as a whole. The opposite, however, might also be true.

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<sup>11</sup> Caleb Finch, *The Biology of Human Longevity: Inflammation, Nutrition, and Aging in the Evolution of Lifespans* (Elsevier, Amsterdam, 2007), 274

<sup>12</sup> Carlos Bozzoli, Angus Deaton and Climent Quintana-Domeque, 'Adult height and Childhood Disease', *Demography*, 46, 4 (2009), 647-69.

<sup>13</sup> Howard Bodenhorn, Carolyn Moehling and Gregory N. Price, 'Short Criminals: Stature and Crime in Early America', *Journal of Law and Economics*, 55, 2 (2012), 416.

Changes in the law, or the application of laws, different policing or sentencing policies, or increases in offending, might all impact upon the mean height of prisoners by year of birth in ways that bear little relation to societal trends.<sup>14</sup>

This presentation uses information about prisoners convicted in all levels of the Tasmanian court system between 1865 and 1924, to explore these issues in greater depth. In the mid-1860s the *Tasmanian Police Gazette* started to carry descriptions of prisoners discharged from gaol. It also reported data for others who had been convicted and awarded a variety of custodial and non-custodial sentences. The colony was no stranger to such procedures. An elaborate bureaucracy of surveillance had been established during the convict era. These files continued to be updated long after the last convict vessel had arrived in May 1853. Yet by the 1860s the proportion of offenders in Tasmanian courts who were former convicts was decreasing. The *Tasmanian Police Gazette* was a useful innovation in that it provided a platform for circulating descriptions of discharged prisoners who had either arrived free or were colonially born and therefore did not have an entry in the records of the former convict department.

We have extracted information for 39,109 prison discharges and convictions detailed in the pages of the *Tasmanian Police Gazette* between 1865 and 1924. Many of these records, however, relate to individuals who appear more than once. We used an algorithm to internally link the file matching prisoners' surnames and forenames, recorded places of birth and age. For those who had not been born in the colony we were also able to compare the information provided on the ship that had conveyed them to Tasmania. In cases where there was insufficient information in other fields to determine whether two records were for the same individual we compared hair and eye colour and other distinguishing features such as scars and

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<sup>14</sup> Howard Bodenhorn, Timothy Guinnane, Thomas Mroz, (2014), *Caveat Lector: Sample Selection in Historical Heights and the Interpretation of Early Industrializing Economies* (National Bureau of Economic Research Working Paper 19955, 2014).

tattoos. In those cases where we were still not sure we erred on the side of caution and did not link the records. The results of this work are detailed in Table 1.

We do not have access to data on the height of the Tasmanian population as a whole. It is not possible, therefore, to determine whether the offenders in our record group were shorter than those who managed to stay clear of the courts but were born in the same year and place. It is possible, however, to compare the stature of convicts with multiple records with those for whom we could only find one recorded conviction. These revealed that when it came to height not all recidivists were alike.

There was a strong relationship between repeat offending and stature amongst males—the repeat offenders were noticeably shorter. The same did not apply to female offenders although the sample size for multiple offending women is much smaller. When the stature of single and repeat offenders was examined in more detail further differences emerged. While Tasmanian born and former convict recidivists were shorter than their fellow inmates who only had one record of conviction, no statistically significant difference was evident amongst those who arrived free (see Table 2).

The former convicts described in the pages of the *Tasmanian Police Gazette* are particularly interesting. Every one of these was a repeat offender in that they had already been convicted of an offence deemed serious enough by a court in Britain or Ireland to warrant a sentence to transportation. When the heights of the former convicts convicted after 1865 were compared with those for all male convicts who arrived in Tasmania in the period 1816-1853, those who went on to accumulate a colonial record of conviction appear short. In other words even when measured on arrival in Australia they were shorter than their compatriots for whom no post-1865 record of conviction could be found (see Fig. 1).

A comparison of the heights of Tasmanian born prisoners with multiple offence histories and those for whom we could only find one conviction revealed a similar story. We have used z-scores to accentuate the differences between the two

groups. The z-score plots the number of standard deviations each age group falls below the World Health Organisation height by year of birth mean for a reference population measured in 2006.<sup>15</sup> The dips in scores for Tasmanian prisoners aged between 10 and 18 reflect the extent to which the juvenile growth spurt was delayed amongst historical populations compared to current adolescent growth trajectories (see Fig. 2). The important issue here, however, is the extent to which the heights of multiple offenders fell below those of the same age with only one recorded conviction. As with convicts it would be possible for an observer of Tasmanian teenagers in the second half of the nineteenth-century to single out those more likely to go on to accumulate a history of multiple offending on the basis of height alone.

We also found a relationship between height and age on conviction. Colonially born male offenders whose first appearance in the *Police Gazette* occurred at the age of 21 were shorter than those whose first appearance was at the age of 22 and so on. This relationship extended to prisoners in their thirties, in other words long after biological growth would have ceased. Thus the older an offender was on first conviction, the taller they were likely to be. This curious pattern has been noticed by others. It was a feature that prisoners admitted to the Eastern and Western State Penitentiaries in Pennsylvania also exhibited.<sup>16</sup> Unlike prison data, however, our records also provide information on offenders who were convicted, but were not awarded custodial sentences.

We found that those who were not sentenced to prison were taller than those who were, and that the more times an individual was incarcerated the shorter they were likely to be (see table 3). This was particularly the case amongst colonially born male prisoners—every ten convictions was associated with a loss in height of 0.45

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<sup>15</sup> We used the WHO 2006 series since this is a standard international measure of comparison used to assess growth patterns amongst contemporary juvenile populations. While it would have been better to use a nineteenth-century standard no such comparative data currently exists.

<sup>16</sup> Howard Bodenhorn, Carolyn Moehling and Gregory N. Price, 'Short Criminals: Stature and Crime in Early America', *Journal of Law and Economics*, 55, 2 (2012), 394.

inches. The relationship was less strong amongst former convicts, but still evident. Every ten convictions for men who arrived in Tasmania on a convict vessel was associated with a loss in stature of 0.27 inches (see table 4).

We also found evidence of a relationship between height and occupation. Prisoners with manual occupations were on average shorter than shopkeepers, who in turn were shorter than those who were professionally qualified. Class issues were clearly at work too. This remained so when we ran a regression model examining the relative association between these different factors and mean reported adult stature (see table 5).

The relationship between height and multiple offending is reminiscent of the issues associated with serious and persistent offending. As historical studies of offending patterns in the British Isles have established, serious offenders tend to commit few offences over the life cycle, while persistent offenders commit few serious offences.<sup>17</sup> In other words, while a small group of individuals might appear in court multiple times, the offences for which they are convicted are mostly trivial and do not attract lengthy custodial sentences. One way of looking at our results is to argue that persistent offenders tend to be short and serious offenders tall. This would help to explain why taller prisoners tend to receive longer sentences.<sup>18</sup>

While some have argued that increases in the number of individuals convicted is likely to be associated with an increase in mean height as a better class of citizen is driven to crime in periods of economic hardship, we found no evidence of this.<sup>19</sup> In nineteenth-century Tasmania increases in the number of convictions recorded in the population as a whole were associated with a reduction in the mean

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<sup>17</sup> Barry Godfrey, David Cox and Stephen Farrall, *Serious Offenders: An Historical Study of Habitual Criminals* (Clarendon, Oxford, 2010) and Barry Godfrey, David Cox and Stephen Farrall, *Criminal Lives: Family Life, Employment and Offending* (Clarendon, Oxford, 2007).

<sup>18</sup> Howard Bodenhorn, Carolyn Moehling and Gregory N. Price, 'Short Criminals: Stature and Crime in Early America', *Journal of Law and Economics*, 55, 2 (2012), 395.

<sup>19</sup> Howard Bodenhorn, Timothy Guinnane, Thomas Mroz, (2014), *Caveat Lector: Sample Selection in Historical Heights and the Interpretation of Early Industrializing Economies* (National Bureau of Economic Research Working Paper 19955, 2014).

height of offenders whose details were circulated in the pages of the *Police Gazette*. On one level our findings provide further evidence of the dangers of making casual assumptions about conviction rates and underlying rates of offending.<sup>20</sup> On another they indicate that increases in prosecution rates are just as likely to disproportionately fall on the least well-off as they are to draw a new class of offender into the courtroom. Any police crackdown is likely to target known offenders and since known offenders are usually born into, and remain resident in, areas marked by social and economic deprivation it is perhaps not surprising that they are short.

It is tempting to conclude that the reason for this is that height is a powerful marker of childhood deprivation. The offenders from the most impoverished backgrounds exhibit the greatest level of stunting and also go on to lead lives characterised by low levels of educational capital, skills training and marginalised incomes and as such it is not surprising that they should disproportionately appear in court. There is a problem however. It is difficult to see how environmental factors might drive an association between number of convictions and height amongst men, but not impact upon women.

It is sometimes argued that heightism is instinctive.<sup>21</sup> If this is so it is possible that prosecutors, the police and the court system treated offenders of varying stature in different ways. If such discrimination was at work it is natural to assume that male offenders would be targeted more than female. While being shorter than average is considered to be an undesirable attribute in men, the same does not apply to women. There is less evidence that short women are discriminated against in employment markets for example.

If Tasmanian prosecutors, policemen and magistrates were more likely to ascribe negative character traits to vertically challenged men, however, then they did

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<sup>20</sup> Mike Maguire, 'Criminal Statistics and the Construction of Crime' in Mike Maguire, Rod Morgan and Robert Reiner (eds) *The Oxford Handbook of Criminology* (Oxford University Press, Oxford, 2007), 241-301.

<sup>21</sup> Isaac B. Rosenburg, 'Height Discrimination in Employment', *Utah Law Review*, 910.

so in remarkably sophisticated ways—singling out the short who happened to be colonially born or former convicts—but disregarding height when it came to the prosecution of free migrants for whom there is little evidence of a relationship between diminishing stature and multiple conviction (see table 2). As the colonially born were on average taller than those who arrived free, crude visual discrimination is unlikely to account for the association between diminished stature and multiple offending. Thus, while multiple offenders who were native Tasmanians may have been shorter than their compatriots with only one recorded conviction, they were still significantly taller than migrant single offenders. Any tendency to discriminate against defendants on the basis of height alone would have benefitted Australians over those born in the British Isles.

Height was one of a number of ways in which class markers that operated in the old world were disrupted in the new. As one observer said of the colonially born children of convicts in 1827, ‘All our six–feet high native boys and girls have sprung from these “reprobates”’.<sup>22</sup> The crucial point is that, while unskilled Australian prisoners were short compared to others who were born in the colonies, they were tall compared to British free migrants.

Visitors to Australia often found themselves confused since the delineators of class that had served them well in the British Isles broke down in the colonies. The working class, for example, tended to be better–dressed confusing eyes trained in the arts of old world social discrimination.<sup>23</sup> It was not always possible to make assumptions about the status of individuals on the basis of how they spoke either. A British, as opposed to an Australian accent, might denote someone who had migrated to Australia as a free passenger, or someone who had arrived on a convict

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<sup>22</sup> John Moly, *The Native–Born: The First White Australians* (Melbourne, Melbourne University Press 2000), 23.

<sup>23</sup> Penny Russell, *Savage or Civilised? Manners in Colonial Australia* (University of New South Wales Press, Sydney, 2010), 325–50.

ship. As others have noted, it was as though the Antipodes was made for imposters.<sup>24</sup>

If might be argued that the trends in the data reflect local knowledge. In a small community it might have been difficult to disguise social origins. Thus police, prosecutors and courts discriminated against those known to have been transported and their children, and favoured those who were not tainted by the ‘stain’ of convict origins. Yet, a check on a sample of 358 colonially born prisoners who could be linked through birth and marriage records to at least one convict parent found no evidence that prisoners of convict descent were any more likely to have a record of multiple conviction.<sup>25</sup> Furthermore, prisoners who were the children of convicts were found to be taller on average than those born of parents who could not be linked to a record of convict arrival. One explanation for this might be that the families established by former convicts tended to be small, a product of the convict systems attempts to restrict marriage in order to keep female convicts in particular in the colonial workforce.<sup>26</sup> Since many convicts waited to marry until they had served their sentence, fertility amongst former convict couples was low by nineteenth-century standards. This meant, however, that there were less mouths to feed. In summary we could find no evidence that the children of convicts were either short, compared to other offenders, or disproportionately likely to be multiple offenders.

If colonially born prisoners were comparatively tall, those who arrived as convicts were short. Yet male future recidivists were to be disproportionately found within the bottom quartile of the distribution of male convict heights (see Fig. 1). Thus, if discriminatory practices were at work their effect was to target particularly short former convicts—rather than former convicts as a whole.

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<sup>24</sup> Kirsten McKenzie, *A Swindler's Progress: Nobles and Convicts in the Age of Liberty* (University of New South Wales Press, Sydney, 2009), 272.

<sup>25</sup> *Tasmanian Police Gazette*, 1865-1924; Tasmanian Archives and Heritage Office, Permission to Mary Registers, CON 45 and 52 and RGD 39, births. In all we linked 3908 colonially born prisoners to a record of birth.

<sup>26</sup> Kirsty Reid, *Gender, Crime and Empire: Convicts, Settlers and the State in Early Colonial Australia* (Manchester University Press, Manchester, 2007), 123-60.

An alternative explanation is that esteem factors are at work. Some have argued that male children who are shorter than average find themselves stigmatized and as a result develop less robust interpersonal skills. As some researchers put it, they are less likely to develop a positive assessment of their own abilities and as a result are more likely to 'be excluded from groups that foster the development of skills'.<sup>27</sup>

What is enticing about this explanation is that it is likely to impact powerfully in teenage years. One of the ways in which socio-economic disadvantage in childhood impacts upon height is that it both lessens the velocity of the juvenile growth spurt and delays its onset.<sup>28</sup> This effect is particularly noticeable in boys. Thus, the relative height disadvantage experienced by boys from a deprived background will be most pronounced in adolescence. Indeed it is entirely possible for an individual to appear short compared to their age cohort at age 16, but be of average stature at aged 22. This effect can be seen at work in Fig. 2, which plots the z-scores for colonially born boys in our data against those for the 2006 World Health Organisation reference population.

It is possible that the phenomenon of the short male recidivist is the result of a series of factors that impact with most force during adolescence? Because of the manner in which childhood disadvantage impacts upon the juvenile growth spurt, the sons of the poor were particularly short during their growing years. This was a phenomenon that would apply both in industrialising Britain and the Australian colonies. While the colonially born may have been taller than those raised in Britain and Ireland, those who grew up in disadvantaged suburbs were on average still shorter than the sons of the better off—a difference that would have been most perceptible in adolescence.

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<sup>27</sup> Nicola Persico, Andrew Postlewaite and Dan Silverman, 'The Effect of Adolescent Experience on Labor Market Outcomes: The Case of Height', *The Journal of Political Economy*, 112, 5 (2004), 1022.

<sup>28</sup> John M. H. Buckler, 'Growth at Adolescence' in Chris Kelnar, Martin Savage, Paul Saenger, Chris Cowen (eds) *Growth Disorders* (CRC Press, Boca Raton, 2007), 150-64.

Did short boys feel more alienated? Did diminished stature equate to a diminished sense of worth which in turn led to a greater propensity to offend? These questions are impossible to answer. It is, however, conceivable that disadvantaged male teenagers were more at risk of prosecution. Indeed it is reasonable to presume that if there was a discriminatory gaze at work then it impacted most during the years when the height difference between the advantaged and the disadvantaged was most powerfully visible. What is intriguing about this is that other studies have demonstrated a strong relationship between the number of encounters with the court system accumulated over an individual's life cycle and the age at which the first prosecution is recorded.<sup>29</sup> If short juveniles were at greater risk of prosecution, then it is entirely conceivable that they might go on to accumulate further records of offending later in life.

The possibility that a series of effects made juvenile boys from poor backgrounds particularly vulnerable to prosecution is intriguing. This might help to explain why we do not see the same relationship between stature and multiple offending amongst prisoners arrested in Tasmania who had arrived as free migrants. While they may have been short by colonial standards, they were on average taller than the British marginalised poor. It is thus possible that their juvenile experiences were different from those who ended up being lagged to Tasmania as convicts. If it was not being short *per se* that drove the association between height and multiple offending, but being relatively short during adolescence, then one would not expect the stature disadvantage of free migrants in colonial courts to put them at greater risk of prosecution once they had arrived in Australia. This might also help to explain why those who first enter prison at older ages are on average taller.

While these observations are necessarily speculative they highlight some of the advantages that might be gained from analysing crime series data that include

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<sup>29</sup> Matt DeLisi, 'Zeroing in on Early Arrest Onset: Results from a Population of Extreme Career Criminals', *Journal of Criminal Justice*, 34 (2006), 17-26.

observations for prisoners born in both the British Isles and the colonies. Although the impact of discrimination is notoriously difficult to separate from other factors that have more deep seated causes, datasets that include observations for both migrants and the locally born present the opportunity to reconstruct offending histories that have the necessary geographical and longitudinal complexity to explore the relationship between stature and offending.

Table 1, Number of Convictions and Unique Individuals Recorded in the *Tasmanian Police Gazette* by Status and Sex, 1864-1924,

|                  | Male         |             | Female       |             |
|------------------|--------------|-------------|--------------|-------------|
|                  | Observations | Individuals | Observations | Individuals |
| Former convict   | 9814         | 6549        | 3135         | 2205        |
| Free Migrant     | 5518         | 4198        | 655          | 500         |
| Born Australia   | 16165        | 10418       | 3530         | 2255        |
| Status uncertain | 355          | 330         | 109          | 107         |

Table 2, Mean Height By Status, Sex and Number of Convictions

|                                   | Males                    |                                   | Females                  |                                   |
|-----------------------------------|--------------------------|-----------------------------------|--------------------------|-----------------------------------|
|                                   | One recorded conviction  | Multiple convictions <sup>a</sup> | One recorded conviction  | Multiple convictions <sup>a</sup> |
| Born in the Colony (aged 21-50)   | 67.23 ins<br>(n = 3,990) | 66.76 ins ***<br>(n = 1,753)      | 62.49 ins<br>(n = 834)   | 62.30 ins<br>(n = 336)            |
| Arrived free (aged 21-50)         | 66.43 ins<br>(n = 2,705) | 66.39 ins<br>(n = 493)            | 61.85 ins<br>(n = 254)   | 62.72 ins<br>(n = 54)             |
| Arrived as a convict (aged 21-70) | 65.33 ins<br>(n = 4,412) | 65.05 ins ***<br>(n = 1,188)      | 61.33 ins<br>(n = 1,196) | 61.42 ins<br>(n = 319)            |

Welch t-test (assuming unequal variances) evaluates the statistical significance of mean height for single conviction being greater than mean height for multiple convictions.

\*\*\* statistically significant at the 1 per cent level.

<sup>a</sup>To control for multiple observations only the first measurement for each recidivist where that individual was aged at least 21 was used in the regression.

Table 3 Difference in Height for Colonial Born Male defendants Awarded Custodial and Noncustodial Sentences.

| Years Born | Height inches         |     | Variation in height. |     | Variation in height. |     | Variation in height. |     |
|------------|-----------------------|-----|----------------------|-----|----------------------|-----|----------------------|-----|
|            | Noncustodial sentence |     | Less than 1 month    |     | 1 – 6 months         |     | More than 6 months   |     |
| 1841-1860  | 67.51                 | *** | -0.89                | *   | -1.05                | **  | -0.46                |     |
| 1861-1880  | 67.73                 | *** | -0.84                | *** | -0.88                | *** | -0.52                | *   |
| 1881-1900  | 67.54                 | *** | -0.29                | *   | -0.43                | *** | -1.03                | *** |

Linear Regression (least-squares)

\* significant at 10 per cent level

\*\* significant at 5 per cent level

\*\*\* significant at 1 per cent level

Table 4 Decrease in Stature per Recorded Conviction

|   | Decrease in mean stature per each recorded conviction | P value   |
|---|---|-----------|
| Colonially born male prisoners aged 21-50 | -0.045 ins  | 0.000 *** |
| Former male convicts aged 21-70           | -0.027ins   | 0.011 *   |

Linear Regression (least-squares)

P value = significance

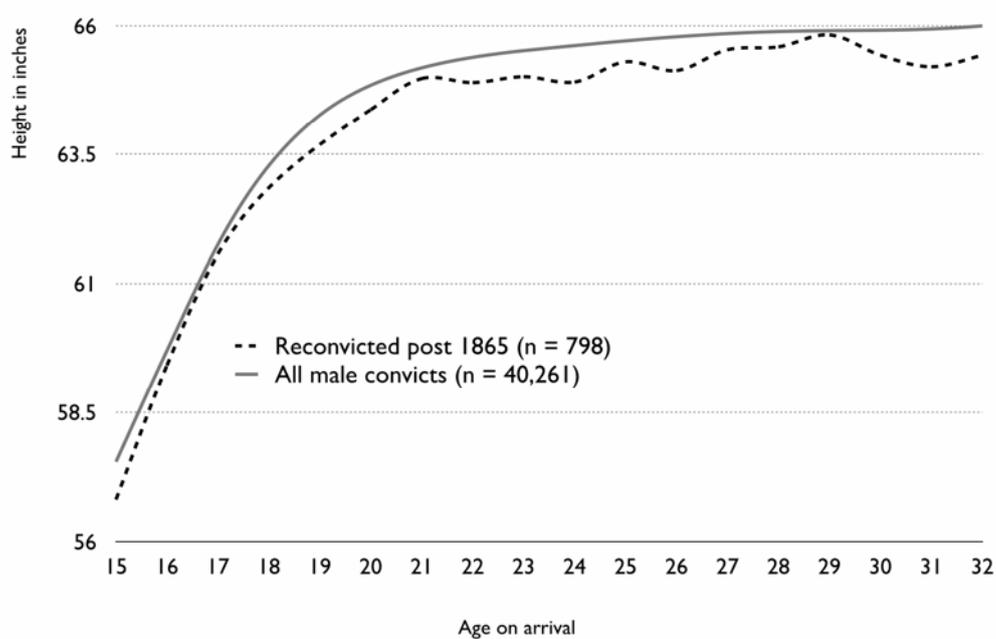
Table 5 Height by Occupation, Sentence Type and Conviction History, Colonially Born Prisoners aged 21-40.

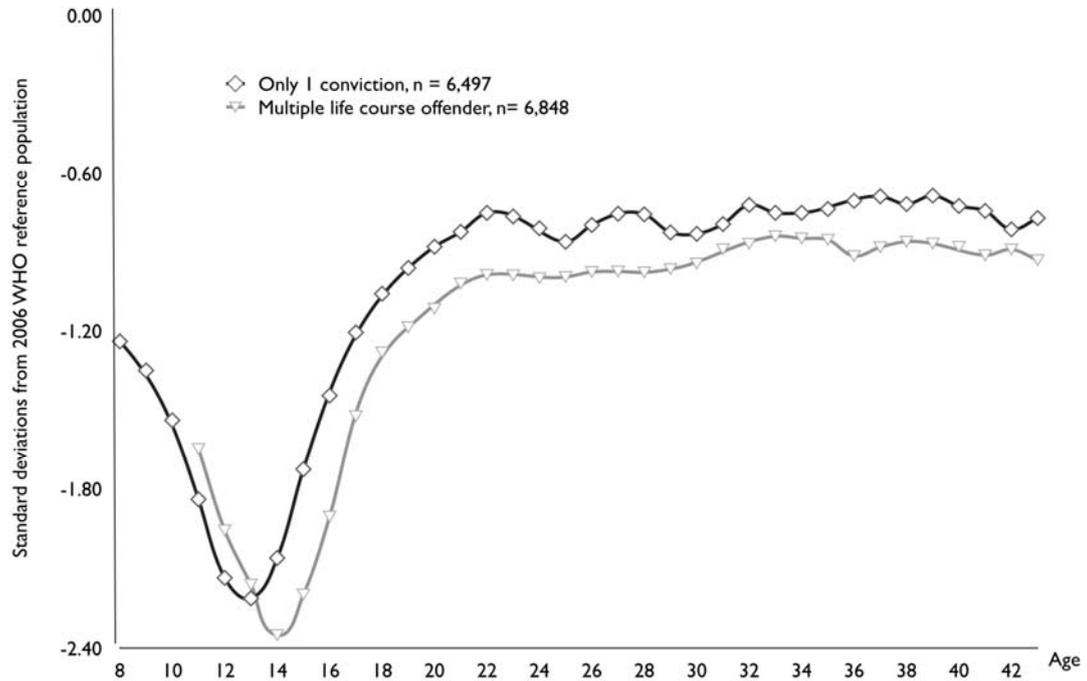
| Group   | n =  | Estimate<br>(height in<br>inches) | P value   |
|---|------|-----------------------------------|-----------|
| (Intercept)<br>Unskilled, multiple<br>offender, custodial<br>sentence | 685  | 67.117                            | 0.000 *** |
| semi-skilled  | 197  | -0.607                            | 0.003 **  |
| Skilled   | 726  | -0.042                            | 0.732     |
| Middling  | 202  | 0.496                             | 0.024 *   |
| Professional  | 15   | 2.333                             | 0.006 **  |
| Non-custodial sentence  | 1034 | 0.229                             | 0.030 *   |
| Single offence  | 1502 | 0.385                             | 0.000 *** |

Linear Regression (least-squares)

P value = significance

Fig. 1 Heights as recorded on arrival for male convicts.



**Fig. 2 Z scores by age for male Tasmanian born prisoners (3 year moving average)**

Source: *Tasmanian Police Gazette*, 1865-1924