

Thresholds and Transmissions:
Youth Drink-Driving and the Intergenerational Link
Evidence from New Zealand

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Abstract

Young people are disproportionately represented in drink-driving statistics, and a first conviction can have lasting economic and social consequences. In New Zealand, the Graduated Driver Licensing System (GDLS), the minimum legal purchasing age (MLPA), and the zero-alcohol limit for drivers under age 20 create three key legal thresholds at ages 16, 18, and 20 that shape young people's access to driving and alcohol. This thesis uses linked administrative microdata from Statistics New Zealand's Integrated Data Infrastructure (IDI), covering 427,899 young New Zealanders born between 1996 and 2003, to examine the causal effects of these thresholds on drink-driving offending and whether these effects differ by parental drink-driving conviction history.

Using a cohort-based parametric regression discontinuity design, I estimate discrete changes in offending at each threshold and examine heterogeneity by socioeconomic deprivation, geographic location, and ethnicity. The results show that turning 16 is associated with a gradual increase in drink-driving offending among males, reflecting increased access to driving. Turning 18 produces a sharp and persistent increase in male offending, consistent with legal access to alcohol. At age 20, offending appears to decline sharply, but this reflects reclassification of drink-driving offences as the legal blood alcohol limit increases, rather than a genuine reduction in risky behaviour.

Youth with parental drink-driving convictions exhibit substantially higher offending rates at all thresholds. However, their proportional response to each threshold is broadly similar to that of youth without parental convictions, indicating that the observed gap primarily reflects higher baseline offending rather than greater sensitivity to legal changes. This suggests that age-based policies alone are unlikely to eliminate intergenerational disparities. The highest risk is observed among youth in high-deprivation areas, rural areas with limited transport alternatives, and Māori youth, who are disproportionately represented among those with parental conviction histories. Although drink-driving rates have declined across successive birth cohorts, the absolute gap by parental background persists.

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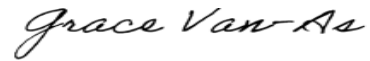
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Attestation of authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

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1. Introduction

Young drivers are disproportionately involved in alcohol-related traffic offending, making drink-driving one of the most consequential forms of youth risk-taking. Those who grow up in households where a parent has been convicted of drink-driving are more likely to offend than their peers. Even where no physical harm results, a first conviction carries significant and lasting consequences for the offender's economic and social prospects. Research using New Zealand administrative data finds that a first drink-driving conviction reduces re-employment opportunities in ways that persist over time (Dasgupta, Ghimire and Plum, 2025). Understanding which young people are most at risk of acquiring such a record, how parental conviction history shapes that risk, and at which moments in their life course, carries implications not only for road safety but for long-term social and economic outcomes.

Age-based restrictions on alcohol access are the primary legislative mechanism through which governments seek to limit alcohol-related harm among young people. These restrictions take two broad forms: a minimum legal purchasing age (MLPA), which regulates only the right to buy alcohol, and a minimum legal drinking age (MLDA), which governs both the right to purchase and consume it. The design and enforcement of these thresholds vary considerably across national contexts.

Minimum legal drinking thresholds differ internationally, ranging from 18 in countries such as New Zealand, Australia, and the UK to 21 in the United States. Prior research consistently finds that crossing these thresholds increases alcohol consumption and related harms. Studies using regression discontinuity designs have documented increases in drinking and alcohol-related harms at the moment of eligibility, with effects detectable in traffic injuries, hospital admissions, and criminal offending (Carpenter and Dobkin, 2015; Dehos, 2022). Most of this evidence comes from single-threshold settings, and little is known about how multiple interacting thresholds shape offending trajectories, or whether parental background moderates the behavioural response to each threshold.

New Zealand offers a distinct setting for addressing these gaps. The interaction between the Graduated Driver Licensing System (GDLS), the MLPA at 18, and the zero-alcohol limit for drivers under age 20 creates three legally relevant age thresholds. At 16, a young person gains their first supervised driving rights through a Learner's licence. At 18, they simultaneously gain MLPA purchasing rights and, for many who had previously gained their Restricted licence, eligibility to sit the full driving licence test, alongside a range of other legal transitions including the move from Youth Court to adult court jurisdiction. At 20, the zero-alcohol driving limit that applies to all drivers under that age is replaced by the adult blood alcohol threshold, legally transforming what had been a drink-driving offence into a lawful act. Together, these three thresholds create a natural experiment for studying how legal rights interact with age to shape drink-driving offending.

Parental alcohol-related behaviour has been identified as a consistent and independent predictor that operates alongside and interacts with the legal environment. Hjalmarsson and Lindquist (2010) find that sons with convicted fathers are 2.3 times more likely to hold a drink-driving record, with the association concentrated before age 20, suggesting transmission operates through behavioural channels active in adolescence. Evans-Whipp et al. (2013) find that adolescent exposure to others' drink-driving increases the likelihood of self-reported drink-driving in young adulthood by more than 60 percent. Understanding how parental background interacts with the legal environment facing young drivers is therefore central to understanding who is most at risk and why. No prior study has examined all three New Zealand legal age thresholds simultaneously or tested whether parental drink-driving conviction history moderates the response to each one.

My thesis uses linked administrative microdata from Statistics New Zealand's Integrated Data Infrastructure (IDI), covering 427,899 young New Zealanders born between 1996 and 2003, to examine drink-driving offending around all three age thresholds, stratified by parental drink-driving conviction history. I apply a cohort-based parametric regression discontinuity (RD) design to estimate the causal effect of each threshold on drink-driving offending among young people aged 15 to 21.

Two research questions guide my analysis. First, what is the causal effect of the Learner's licence at 16, the minimum legal purchasing age at 18, and the transition to the adult blood alcohol limit at 20 on drink-driving offending, and does parental drink-driving conviction history amplify this effect? Second, do these effects vary by socioeconomic status, geographic location, and ethnicity?

The results show that legal thresholds matter. The age 16 Learner's licence is associated with a gradual increase in drink-driving offending among males. The age 18 minimum legal purchasing age produces a sharp, permanent increase. At age 20, offending appears to fall sharply, but this reflects reclassification of the offence as the adult blood alcohol limit takes effect, not a genuine reduction in impaired driving.

Youth whose parents have a drink-driving conviction offend at higher rates at every threshold, but the proportional response to each threshold is broadly similar across parental background groups, indicating that the gap reflects higher baseline offending rather than differential sensitivity to the legal changes themselves. Drink-driving risk is most pronounced among youth in high-deprivation areas, rural areas where alternative transport options are scarce, and among Māori youth, who are disproportionately represented among those with parental conviction histories. Baseline drink-driving rates have declined across successive birth cohorts, but the absolute gap between parental background groups persists.

This distinction between the absolute and relative dimensions of the parental background effect implies that threshold-level policies, while valuable, will not close the gap between parental background groups on their own. The elevated baseline from which the high-risk group starts is the primary driver of the absolute gap, and reducing that baseline requires interventions that reach youth and their families before the first legal threshold arrives. A parent's drink-driving conviction is a moment of contact between a high-risk household and the justice system; it is also a signal that their children may be on a trajectory toward higher drink-driving risk. These trajectories are established through processes operating in the household well before the age at which they become visible in offending data.

My findings provide the first regression discontinuity estimates of all three legal age thresholds in New Zealand using drink-driving offences as a distinct outcome, and shed light on whether parental conviction history moderates the behavioural response to each threshold. The results also identify which young people face the greatest drink-driving risk, with direct implications for the design of targeted prevention policies.

The remainder of my thesis is structured as follows. Chapter 2 reviews the empirical literature on legal age thresholds and alcohol-related offending, heterogeneity in drink-driving risk, and the intergenerational transmission of drink-driving and criminal behaviour. Chapter 3 describes the institutional background of the New Zealand GDLS, MLPA and zero-alcohol limit for drivers under age 20. Chapter 4 sets out the data and the construction of the analytical sample. Chapter 5 presents the methodology. Chapter 6 reports the results. Chapter 7 discusses the findings and their implications for policy and future research. Chapter 8 concludes by summarising the key findings and their implications.

2. Literature Review

2.1 Legal Age Thresholds and Drink-Driving

Minimum legal age regulations aiming to reduce alcohol-related harms take different institutional forms across countries. In New Zealand, as in Australia and the United Kingdom, a minimum legal purchasing age (MLPA) of 18 restricts the right to buy alcohol, while in the United States the minimum legal drinking age (MLDA) of 21 governs both the purchase and consumption of alcohol. A body of research has studied the consequences of these thresholds using quasi-experimental methods, exploiting legal age cutoffs as sources of exogenous variation in alcohol availability.

Carpenter and Dobkin (2009, 2015, 2017) provide foundational regression discontinuity evidence from the United States, with three studies establishing that age-based restrictions on alcohol access have substantial effects on consumption, mortality, and offending. Their 2009 study finds that individuals just over age 21 drink on 21 percent more days than those just under, with a 9 percent increase in mortality driven by alcohol-related deaths, motor vehicle fatalities, and suicides. Their 2015 study draws on California arrest data to document significant increases in drink-driving, public disorder, and violent crime at the same threshold. Their 2017 study shows that nonfatal injuries also rise sharply at age 21, with inpatient hospital admissions and emergency department visits increasing substantially, driven primarily by accidental injuries and alcohol overdoses.

Chalfin, Hansen and Ryley (2019) extend this approach by examining victimisation rather than offending, using administrative crime records with exact birth dates from eight US cities between 2007 and 2018. Applying the same sharp RD framework at age 21, they find that victimisation rates also increase at the MLDA, with male victimisation rising by around 7 percent across assault, robbery and theft, and female sexual assault victimisation rising by 25 percent. Effects are concentrated in non-residential locations and persist beyond birthday celebration effects.

Joksch and Jones (1993) provide earlier evidence from the United States using a different approach, examining changes in arrest rates across states that raised their minimum drinking age during the 1980s. Using Uniform Crime Reports data from 1980 to 1987 and comparing affected age groups to an older comparison group, they find reductions of approximately 10 percent in vandalism and public disorder arrests following increases in the minimum drinking age, with weaker and inconsistent effects for more serious violent crimes. The pattern suggests that effects of restricting legal alcohol access are larger for less severe offences.

Dehos (2022) examines a comparable threshold in Germany, where the minimum legal purchasing age (MLPA) for beer and wine rises from 16 to 18. Using individual-level administrative data and an RD design at age 16, the study finds significant increases in alcohol-related criminal offences at the threshold, with effects driven primarily by first-time offenders. The findings indicate that gaining legal alcohol access at 16 leads to measurable increases in offending, particularly for offences most closely linked to acute intoxication.

Keall, Frith and Patterson (2004) provided direct New Zealand evidence on the elevated crash risk of young drivers using alcohol. Combining data on fatally injured drivers in crashes occurring on Friday and Saturday nights between 1995 and 2000 with a large roadside breath-testing control sample of 85,163 drivers, they estimated fatal injury risk by blood alcohol concentration (BAC), age and number of passengers using a conditional logistic model. The results show that drivers aged under 20 face more than five times the fatal injury risk of drivers aged 30 and over at every BAC level, and drivers aged 20 to 29 face three times the risk. These age effects are multiplicative with both BAC and passenger count: a teenage driver at the legal limit of 30 mg/dl carrying two or more passengers faces 34 times the fatal injury risk of a sober driver aged 30 and over travelling with a single passenger.

In 1999 New Zealand Parliament voted to lower MLPA from 20 to 18, a legislative change which has been the subject of ongoing debate and empirical research. Kypri, Davie, McElduff, Langley and Connor (2017) provide direct evidence on the consequences of the legislative change using NZ Police traffic crash data from 1996 to 2010 and a controlled before-and-after comparison with 20 to 21-year-olds as the reference group. They find that lowering the MLPA was followed by long-term increases in traffic injury attributable to alcohol-impaired male drivers aged 18 to 19. Injury rates attributable to 15 to 17-year-old drivers also increased relative to the control group in the second and third post-change periods, indicating a trickle-down effect to younger age groups through exposure to older peers who had newly gained legal alcohol access. Dasgupta, Plum and Erwin (2022) examine the same legislative change using IDI court charges data and a sharp regression discontinuity design. A key methodological contribution is distinguishing between age-dependent and age-independent alcohol-related convictions, as certain offences apply only below specific age thresholds and therefore obscure the true effect on alcohol-related crime. After removing these confounding influences, the study finds no statistically meaningful increase in overall or age-independent measures of alcohol-related crime at the MLPA of 18.

Boes and Stillman (2024) revisit the legislative change using two complementary approaches. The first is an event history analysis comparing accident rates immediately before and after the December 1999 law change; the second is a cohort analysis tracking birth-year cohorts across the age-accident profile, applied to the full universe of injury accidents from 1996 to 2011. In contrast to Kypri et al. (2017), they find no evidence that lowering the MLPA increased alcohol-related accidents among 18 to 19-year-olds, attributing the divergence from earlier findings to model specification: once age-specific trends and control variables are included, the positive effect identified by Kypri et al. disappears.

A related question is whether legal consequences deter repeat offending once drink-driving has occurred. Hansen (2015) provides evidence on the effectiveness of drink-driving punishments in reducing recidivism. The study draws on administrative records of over 500,000 roadside breath-testing stops from Washington State between 1999 and 2007. Blood alcohol content thresholds create discontinuous variation in sentencing severity, which the study exploits using a regression discontinuity design. This allows estimation of the effect of crossing each threshold on repeat drink-driving within four years. Hansen finds that crossing the lower threshold is associated with a 17 percent decline in repeat offending. The pattern of results is most consistent with deterrence as the primary mechanism, rather than incapacitation or rehabilitation.

While much of the literature focuses on offending behaviour, Bindler, et al. (2024) study victimisation at legal age thresholds. They use population-wide Dutch victimisation register data linked to national population registers. They apply a sharp RD design at the age-16 and age-18 legal thresholds. The results show that victimisation rates increase by 9 to 15 percent at each threshold for both males and females. The increases are driven primarily by property offences and are concentrated in locations outside the home. This is consistent with young people spending more time in environments where alcohol is available. To disentangle which rights within the threshold bundle matter, the authors exploit a 2014 reform that raised the minimum legal drinking age for weak alcohol from 16 to 18. They compare cohorts born before the reform, who gained alcohol access at 16, with those born after, who did not. This difference-in-discontinuity analysis shows that access to weak alcohol and bar and club admittance at age 16 is the primary driver of the victimisation increase at that threshold.

The study establishes that gaining legal alcohol access increases not only offending, as documented for the United States by Carpenter and Dobkin (2015) and Chalfin, Hansen and Ryley (2019), but also the risk of becoming a victim of crime. The cohort-based structure of tracking birth-year cohorts as they cross legal age thresholds, provides the empirical template for this thesis.

2.2 Sources of Heterogeneity in Drink-Driving Risk

A substantial body of research examines how factors such as socioeconomic status, location, and ethnicity shape drink-driving risk beyond individual behaviour. Baum (1999) provides aggregate-level evidence on the socioeconomic patterning of drink-driving offending in Australia. The study merges road casualty data with census data at the postcode level across the Sunshine and Gold Coast area. It finds a strong correlation between drink-driving offender rates and area-level socioeconomic characteristics. Specifically, drink-driving offence rates are higher in areas with greater poverty, crowded dwellings, and rural residence, and lower where median educational attainment is higher. The findings demonstrate that socioeconomic disadvantage is not only an individual-level phenomenon but is spatially concentrated. Areas characterised by high deprivation produce systematically higher drink-driving offender rates. This spatial patterning is particularly relevant to the New Zealand context, where the NZ Deprivation Index captures similar area-level dimensions of disadvantage.

Beyond socioeconomic status, rural location has also been shown to shape drink-driving risk independently of individual characteristics. Christoffersen, Sothill and Francis (2008), using a complete Danish birth cohort of all men born in 1966 ($N = 43,403$), find that living outside metropolitan areas makes young men one and a half times more likely to receive a first-time drink-driving conviction after accounting for criminal history, educational attainment, and a range of adolescent disadvantage measures. The attributable fraction for rural residence is 27 percent, the second largest of any factor in the model, reflecting the high prevalence of rural residence rather than effect size alone. The authors attribute this to limited public transport infrastructure, which increases the likelihood that young men drive after drinking. This rural/urban gradient is a relevant contextual factor for the New Zealand setting, where population density and transport access vary substantially across regions.

In the New Zealand context, ethnicity is a further dimension of heterogeneity in drink-driving risk. The Māori Road Safety Outcomes Report documents that Māori drivers, and particularly young Māori men, are over-represented in alcohol-impaired crash deaths and serious injuries (Waka Kotahi, 2021). This over-representation extends to conviction statistics. Plum and Chua (2025) document that among first-time drink-driving convictions between 2008 and 2013, Māori comprised a disproportionate share of offenders. Moreover, despite presenting with comparable alcohol readings to New Zealand European offenders, Māori received more severe sentencing outcomes, indicating that over-representation compounds with downstream disadvantage within the justice system.

The distribution of drink-driving offending across deprivation, urban/rural and ethnicity strata is an explicit focus of the heterogeneity analyses in this thesis.

2.3 Intergenerational Transmission of Alcohol-Related Offending

Evidence from longitudinal cohort studies and population-based administrative registers across New Zealand, Scandinavia, Australia, the United Kingdom, and the United States consistently links parental alcohol behaviour to offspring alcohol use and alcohol-related offending outcomes.

Fergusson and Horwood (1994) draw on the Christchurch Health and Development Study, a longitudinal cohort tracking New Zealand children from birth in 1977. Using data collected at ages 11, 12, and 13 years alongside outcome measures at age 15, they examine whether age at first alcohol exposure predicts subsequent drinking frequency, consumption quantity, and alcohol-related problems. Children introduced to alcohol before age six reported rates of frequent, heavy, or problem drinking 1.9 to 2.4 times higher than those not introduced until after age 13, with these associations remaining statistically significant after adjustment for a range of family, social, and individual covariates. Of particular relevance to the intergenerational transmission literature, the age of first exposure was not associated with family socioeconomic position, parental conflict, or childhood conduct disorder, but was significantly correlated with parental drinking frequency, parental approval of adolescent consumption, and parental attitudes favouring alcohol use. The authors interpret early exposure as partly reflecting broader home environments in which alcohol is normalised, rather than functioning as a purely independent risk factor. While the study does not examine drink-driving directly, it provides early New Zealand-based evidence that parental alcohol behaviour and attitudes constitute a measurable family environment pathway shaping youth alcohol outcomes, establishing a foundation for the intergenerational transmission mechanisms examined in this thesis.

Christoffersen and Soothill (2003) follow a complete Danish birth cohort of all children born in 1966 ($N = 84,765$) using population-based administrative registers from age 13 to 27. They examine the long-term consequences of parental alcohol abuse across a range of outcomes including criminality, self-harm, family disruption, and unemployment. Parental alcohol abuse is measured through hospital admissions. After controlling for associated disadvantages including parental mental illness, domestic violence, and family separation, parental alcohol abuse independently predicts an elevated risk of violent criminal conviction among male offspring. Boys of alcoholic mothers are more than one and a half times more likely to be convicted of a violent crime. While the study does not examine drink-driving directly, it establishes that parental alcohol abuse has measurable intergenerational consequences for offspring criminal behaviour that persist into young adulthood. Building on this foundation, Christoffersen, Soothill and Francis (2008) use the same cohort to narrow the focus to drink-driving specifically, finding that parental substance abuse independently predicts a first-time drink-driving conviction after controlling for prior criminal history, educational attainment, and the same range of adolescent disadvantage measures.

Maldonado-Molina et al. (2011) use data from the National Longitudinal Study of Adolescent Health in the United States, a school-based panel study following 9,559 adolescents from ages 11 to 26 across two waves of data collection. At Wave I (1994–1995), adolescents aged 11 to 19 completed in-home interviews alongside a separate parent survey. At Wave III (2001–2002), the same participants, now averaging age 21, reported on their own drink-driving behaviour. The study used survey logistic regression to examine the relationship between parental and peer alcohol use and self-reported drink-driving, with analyses stratified by gender. They find that parental alcohol consumption independently predicts drink-driving among both young women and young men after controlling for demographic, contextual, and individual-level factors. A notable finding is the interaction between parental and peer alcohol use: peer alcohol use significantly predicts drink-driving only when parents do not drink. When parents report alcohol use, peer alcohol use is no longer a significant independent predictor. The authors interpret this as consistent with social learning theory, suggesting that parental alcohol use may dominate the social learning environment and reduce the additional influence of peers. While the study measures parental alcohol consumption generally rather than parental drink-driving specifically, it establishes that parental alcohol behaviour shapes offspring drink-driving risk through mechanisms operating in adolescence and persisting into young adulthood.

Hjalmarsson and Lindquist (2010a) provide direct evidence on intergenerational transmission in drink-driving using the Stockholm Birth Cohort, a sample of 15,117 individuals born in 1953 linked to their fathers' administrative drink-driving records. Sons with convicted drink-driving fathers are 2.3 times more likely to hold a drink-driving record themselves. The association is particularly pronounced during adolescence: sons with convicted fathers are 3.1 times more likely to offend as youth, compared to 2.1 times as adults. Hjalmarsson and Lindquist conclude that intergenerational associations in drink-driving appear before age 20 and weaken as cohort members age into adulthood. Crucially, the association persists after controlling for parental alcoholism, paternal criminal convictions of any kind, sons' IQ scores, and family socioeconomic status, suggesting that the transmission is specific to drink-driving rather than simply reflecting a general tendency for crime to run in families.

In a companion study using Swedish adoption data, Hjalmarsson and Lindquist (2013) show that both pre-birth and post-birth factors independently contribute to intergenerational associations in crime, with post-birth channels including the criminal records of adoptive parents playing an equally important role to genetic inheritance in determining whether sons offend at all, and an even greater role in determining how often they offend. While examining general criminal behaviour rather than drink-driving specifically, they provide supporting evidence that environmental transmission mechanisms operate independently of genetic inheritance in the intergenerational reproduction of offending. Together, these studies establish that parental drink-driving convictions predict sons' drink-driving through mechanisms that are behaviour-specific, concentrated in adolescence, and not reducible to shared disadvantage or general criminality.

Evans-Whipp et al. (2013) examine a more specific pathway using Australian longitudinal data, focusing on adolescents' exposure to others' drink-driving behaviour. Drawing on 1,956 participants from Victoria, Australia followed from adolescence to young adulthood, they find that young people who report having ridden in a car with a drinking driver during adolescence are more than 60 percent more likely to report drink-driving themselves in young adulthood, after controlling for individual, peer and family risk factors. The authors interpret this as consistent with social learning frameworks, whereby observing others' drink-driving during adolescence normalises the behaviour and increases the likelihood of drink-driving in young adulthood.

Kendler et al. (2018) extend the intergenerational analysis across three generations using Swedish population registers. Examining the transmission of alcohol use disorder from grandparents through parents to grandchildren, they find significant associations at each generational link. Transmission from parent to child is stronger than from grandparent to grandchild. Notably, the association weakens but does not disappear when parents themselves do not have alcohol use disorder, indicating that grandparental alcohol problems carry an independent predictive signal for grandchildren's outcomes. This suggests that the transmission of alcohol-related behaviour across families is persistent and operates through both biological and environmental channels.

Staff and Maggs (2020) use the UK Millennium Cohort Study, a nationally representative prospective dataset following 11,485 children and their parents from infancy to age 14. They find that adolescents whose parents allowed them to drink alcohol were more than twice as likely to engage in heavy episodic drinking at age 14, nearly twice as likely to escalate rapidly from their first drink to heavy drinking, and more than twice as likely to drink heavily three or more times in the past year. These associations hold after controlling for a comprehensive set of child and parent risk factors measured at age 11. The findings establish that parental alcohol permissiveness shapes youth alcohol trajectories through pathways that operate independently of shared socioeconomic and demographic characteristics.

Alexeev (2026) uses 43,817 parent-child observations from 23 waves of the HILDA Survey, constructed via a cohort-layering approach, to estimate intergenerational elasticities of alcohol consumption. Transmission is predominantly same-sex, with a mother-daughter elasticity of approximately 0.10 and a father-son elasticity of 0.09, and no detectable father-daughter effect. Effects concentrate in middle adolescence (ages 15–17) and re-emerge at ages 28–37 around the transition to parenthood. Adoptee-style comparisons find that mother-daughter transmission persists regardless of biological ties, while father-son transmission attenuates in non-birth dyads, consistent with norm-mediated channels for female transmission and a residual biological component for males. The use of a household panel dataset allows the study to account for shared household environment, providing evidence that the transmission of alcohol behaviour has a component not explained by shared circumstances alone.

In summary, the intergenerational literature establishes a link between parental alcohol behaviour and offspring alcohol-related offending outcomes. These associations operate through a combination of direct behavioural transmission, environmental mechanisms, and possibly biological pathways. The link is robust to controls for shared socioeconomic background, is present across multiple generations, and is concentrated in adolescence, when drinking patterns are formed.

3. Institutional Background

This chapter outlines the institutional context of New Zealand's graduated licensing system and alcohol laws.

3.1 Alcohol Laws and New Zealand's Graduated Driver Licensing System

Understanding the legal framework governing youth access to alcohol and vehicles is essential for interpreting the patterns observed in the data. This section describes New Zealand's alcohol-related laws and Graduated Driver Licensing System (GDLS) as they apply to youth, with particular attention to age thresholds at 16, 18, and 20 years that create discontinuities in youth rights and responsibilities. Table 1 presents the age thresholds at which the listed rights are granted to youth.

3.2 Rights Involving Alcohol Consumption

In New Zealand, the Minimum Legal Purchase Age (MLPA) for alcohol is 18 years. No person under the age of 18 can legally purchase alcohol, and those aged 18 or older may enter licensed premises and purchase alcohol upon providing proof of age identification. Under the Sale and Supply of Alcohol Act 2012, alcohol may only be supplied to a person under 18 with the express consent of a parent or legal guardian. Supply must be carried out responsibly, which includes ensuring food and non-alcoholic drinks are available, arranging safe transport, and supervising consumption to limit the strength and amount of alcohol consumed.

Table 1. Rights at Ages 16, 18, 20

	Year age	Year age	Year age	Learner's	MLPA	Higher legal alcohol
Cohort	16	18	21	Licence	Alcohol	threshold while driving
1996	2012	2014	2017	16	18	20
1997	2013	2015	2018	16	18	20
1998	2014	2016	2019	16	18	20
1999	2015	2017	2020	16	18	20
2000	2016	2018	2021	16	18	20
2001	2017	2019	2022	16	18	20
2002	2018	2020	2023	16	18	20
2003	2019	2021	2024	16	18	20

Note: The table presents the age thresholds at which the listed rights are granted to youth according to their birth cohorts. There are no reforms in minimum ages affecting the birth cohorts observed in this study. Author's own representation.

3.3 Rights Involving Driving

Driving rights and responsibilities are governed by a graduated driver licensing system (GDLS). Youth must be 16 years old to apply for a theory test to obtain their learner's licence to practice driving under the supervision of a licensed driver. They can acquire a restricted licence at 16.5 years, provided they have passed the driving test for the Restricted licence. Under the Restricted licence, youth are allowed to drive by themselves between 5am and 10pm, and only with a supervisor in the front passenger seat at other times. Once they turn 17.5 years, they can take their full licence test if they have completed an approved advanced driving course. If they have not completed an advanced driving course, they must be 18 before they can sit the full licence test.

3.4 Penalties for Drink-Driving

The alcohol limit for drivers under age 20 is zero. Youth can be charged with drink-driving if they drive after consuming even one drink. If caught with any alcohol in their breath or blood, they can be fined and given demerit points. They will not receive a criminal record for breath-alcohol levels between zero and 150 micrograms, or blood-alcohol levels between zero and 30 milligrams. If the driver's breath-alcohol level is higher than this, they can be prosecuted through the courts, disqualified from driving, or imprisoned depending on the level of alcohol detected.

The legal threshold is higher for drivers aged 20 and older. Drivers aged 20 and above will be fined if their breath-alcohol level is over 250 micrograms, or blood-alcohol level is over 50 milligrams. This means individuals aged 20 and older can legally consume approximately one standard drink and drive. Alcohol levels higher than these thresholds will result in fines, criminal records, and potential imprisonment depending on the extent to which the limit is exceeded.

3.5 Age Thresholds and Youth Behaviour

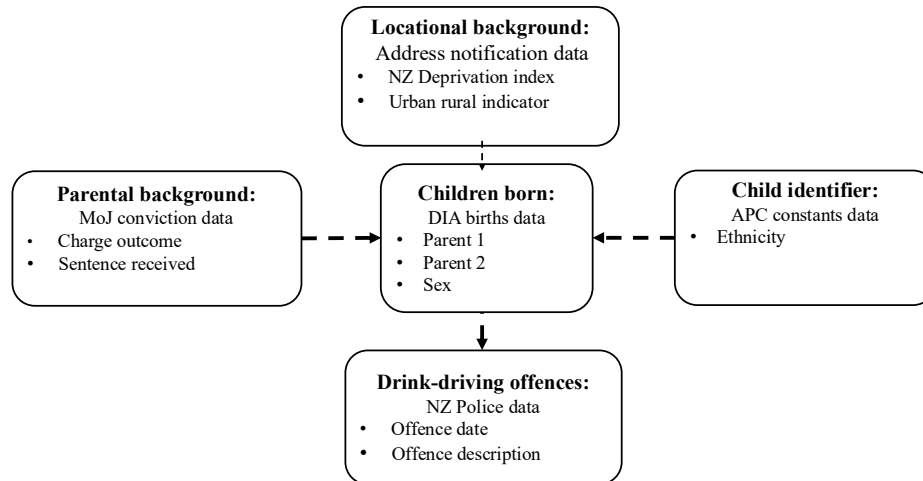
These legal frameworks create three key age thresholds that may affect youth drink-driving behaviour. At age 16, youth gain the ability to drive independently under a restricted licence, though they must still rely on parents or caregivers to supply alcohol. At age 18, youth gain the right to purchase and consume alcohol legally and may also drive others if they have passed their full licence test. At age 20, youth face a higher legal blood-alcohol threshold, meaning they can legally consume a small amount of alcohol before driving.

These rights can sharply change youth behaviour in ways that increase or decrease the probability of drink-driving offending at these age thresholds. For example, the ability to purchase alcohol at age 18 may increase access and consumption, potentially raising drink-driving risk. Conversely, the higher legal threshold at age 20 may reduce the probability of exceeding the legal limit for any given level of consumption. Together, the three thresholds create potential sources of exogenous variation for identifying causal effects, which my empirical analysis leverages to estimate the causal effect of each threshold on drink-driving offending and to examine how these effects vary by parental conviction history.

The next chapters present my empirical strategy for exploiting these age discontinuities to estimate the effects of legal rights on youth drink-driving behaviour and to examine how these effects vary by parental conviction history.

4. Data and Descriptive Statistics

This chapter describes the data and presents descriptive statistics for my analysis of youth drink-driving offences in New Zealand. My primary research question is whether and to what extent parental drink-driving convictions are associated with youth drink-driving behaviour, and how this relationship varies by age, gender, and other socio-demographic characteristics. I used Statistics NZ's administrative research database, the Integrated Data Infrastructure (IDI), to construct a comprehensive dataset for this research. This dataset links youth drink-driving offence records and their parental drink-driving conviction histories. Figure 1. **The linkages between the datasets**



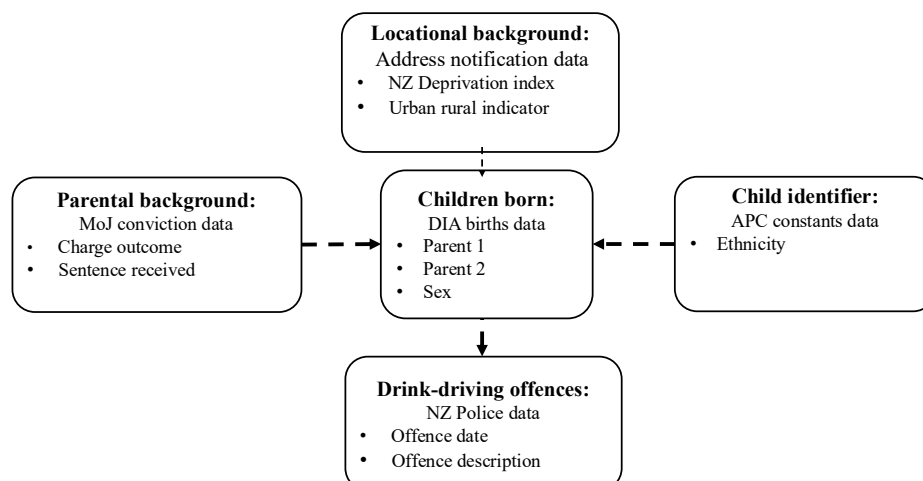
Notes: The figure illustrates the linkages between the datasets from Statistics New Zealand's Integrated Data Infrastructure (IDI) used in this thesis. *Authors own representation.*

illustrates how the IDI tables are linked.

4.1 Integrated Data Infrastructure

To construct my sample dataset, I drew on nine different datasets contained within the Statistics NZ's IDI. The IDI is highly suitable for my research because it is an integrated data environment that links longitudinal microdata about individuals and households. The IDI is particularly suited to this study because it enables linkage between birth records, parental court histories, police offending data, and residential histories at the population level.

Figure 1. The linkages between the datasets



Notes: The figure illustrates the linkages between the datasets from Statistics New Zealand's Integrated Data Infrastructure (IDI) used in this thesis. *Authors own representation.*

The IDI uses a range of parameters to identify the same individual across different records and then assigns an encrypted unique identifier known as the Statistics New Zealand Unique Identifier(*snz_uid*). All source of personal information is removed (e.g., names) or anonymised (e.g., birth dates are changed to birth months) and data for research are created by linking files containing encrypted unique identifiers. Users of the IDI are vetted and trained in the safe use of data. Research projects must be in the public interest and are restricted to the analysis of groups not individuals.

The IDI's longitudinal structure provided access to all drink-driving records and other relevant information on youth and their parents required for my research, with records available for linkage dating back to 1992.

4.2 Identifying the population of interest

The Department of Internal Affairs (DIA) birth records contain information on all births in New Zealand, including birth month, year, gender, and both parents' *snz_uid* values. In DIA birth records, *parent1* and *parent2* correspond to the first and second recorded parents. In practice, these typically align with mother and father identifiers in the cohorts studied. I selected children born between 1996 and 2003 because these cohorts reach the key age thresholds of 16, 18, and 20 during the years for which NZ Police offence data are available and can be observed for at least one year before and after each threshold (i.e., between ages 15 and 21). I restricted the sample to children for whom two parents were recorded in DIA birth records, allowing conviction histories to be constructed for both recorded parents. This restriction does not establish whether the parents lived together or with the child.

After excluding stillborn and deceased children, this yielded a total population of interest of 427,899 individuals.

To identify the ethnicity of the children, I linked the IDI Experimental Administrative Population Census (APC) constants dataset to my spine birth dataset through the universal unique identifier (*snz_uid*). The APC constants dataset is a longitudinal population register maintained by Stats NZ using integrated administrative data from multiple government agencies, including the Department of Internal Affairs, Inland Revenue, the Ministry of Health, and the Ministry of Education.

Unlike the traditional five-yearly census, the APC is assembled entirely from administrative records and is specifically designed to support longitudinal population-level analysis. This table includes variables which are constant over time such as ethnicity, birthplace and years, month of year of birth, month of year of death, and sex.

The APC constants dataset records ethnicity in New Zealand in six groups: European, Māori, Pacific Peoples, Asian, MELAA (Middle Eastern, Latin American, African), and Other.

4.3 Identifying parental convictions

The IDI Ministry of Justice court charges dataset contains records of all charges processed by the criminal courts since 1992. There is one row for every offender per charge, including the date of the offence, the type of offence, when the charge was filed, and when it was resolved. This dataset uses the revised Australian and New Zealand Standard Offence Classification (ANZSOC v2.0.0) to categorise offences. The dataset contains approximately 3,700 distinct offence codes, of which 153 are drink-driving related.

I joined the court charges dataset to my child spine dataset using parent1's *snz_uid* to link each mother's charge history to her child's record. I then joined the IDI's charge outcome meta dataset, which contains the information behind the offence codes, to identify charges that were both drink-driving related and resulted in a conviction and sentencing. Using the relevant offence codes, I added a binary variable which takes the value 1 if the conviction is drink-driving related and 0 if it is not. I repeated the same process using parent2's *snz_uid* to construct a separate panel capturing the father's drink-driving related convictions.

4.4 Identifying youth drink-driving offences

In New Zealand youth offences can be resolved through non-court proceedings such as police warnings or youth justice processes rather than formal convictions. The Ministry of Justice court charges dataset would not capture the full extent of youth drink-driving offending. Therefore, the NZ Police pre-count offenders dataset was more suitable, as it includes all criminal incidents for which there were court or non-court proceedings, capturing a broader range of offending regardless of how it was resolved. The NZ Police pre-count offenders dataset covers offences from July 2009 onwards, which is sufficient to observe the youth born between 1996 and 2003 over the ages 15 to 21.

I joined the NZ Police pre-count offenders dataset with my child spine panel to identify the drink-driving offences committed by youth. I then joined the IDI's charge outcome meta dataset

containing the information behind offence codes to the youth offences panel. This meta dataset allowed me to identify which offences are drink-driving related. I also added a binary variable which takes the value 1 if the offence is drink-driving related and 0 if it is not.

4.5 Identifying locational background

4.5.1 NZ Deprivation Index

Geographic context may play an important role in shaping youth drink-driving behaviour. I therefore incorporated two locational measures into my analysis: the New Zealand Deprivation Index (NZDep2023) as provided by the 2023 Census¹ and the Urban rural Indicator.

The NZDep2023 index was included as a control variable to account for the influence of socioeconomic disadvantage on youth drink-driving behaviour. NZDep is an ordinal scale ranging from 1 to 10, where 1 represents the least deprived areas and 10 the most deprived. A score of 10, for instance, indicates that a meshblock falls within the most deprived 10 percent of all meshblocks in New Zealand. A meshblock is the smallest geographic unit for which Statistics New Zealand collects and processes statistical data. Meshblocks vary considerably in size, from part of a city block to large rural areas, but typically contain between 30 and 60 dwellings, or roughly 60 to 120 residents. To assign deprivation scores to individuals, I began with the address notification dataset from the IDI, which records a history of usual residential addresses allowing a geographic location to be derived for any individual at a given point in time. I joined this to my child spine dataset to create a new panel dataset which captures each youth's residential address alongside corresponding start and end dates and meshblock codes. By matching meshblock codes, I then joined the NZ Deprivation Index dataset to the youth address dataset, enabling deprivation scores to be linked to each youth based on where they lived at the relevant point in time.

4.5.2 Urban rural Indicator

While the NZ Dep captures socioeconomic disadvantage, it does not account for differences between urban and rural environments that may independently shape drink-driving behaviour. For this reason, I also included Urban rural Indicator because urban and rural environments differ in policing intensity, access to alcohol, and availability of public transport, all of which could influence drink-driving offending. This indicator is a statistical geography classification

¹ A limitation is that the area-specific deprivation level can change over time; future research should apply a more flexible approach.

developed by Stats NZ that divides New Zealand into areas sharing common urban or rural characteristics and is used to disseminate a broad range of social, demographic, and economic statistics. I added it to the youth address dataset by joining the 2023 census individual database. From this, I constructed a binary variable taking the value of 1 if the individual's residential address fell within a major or large urban area, and 0 for all rural classifications.

4.6 Data Structure

In this section I describe how I created the full panel of data ready for analysis. I started by creating a baseline panel dataset of 427,899 New Zealand youth born between 1996 and 2003, including their date of birth, sex at birth, ethnicity, and parental identifiers and merging the youth address dataset to my panel to include the NZ Deprivation Index and Urban rural indicator. Then, I joined the parents drink-driving convictions dataset with my baseline panel through parents' *snz_uid*. I created a binary variable which takes the value one if any of the parents of the youth had a drink-driving conviction before the youth turned fifteen years old. I chose age fifteen as the cut-off for measuring parental convictions for two reasons. First, this ensures that parental convictions precede the period during which youth driving behaviour is observed (ages 15-21), establishing a clear temporal ordering. Second, this approach captures parental behaviour during the child's formative years when parental influence is likely strongest. A youth is classified as having a parental drink-driving conviction if either parent had at least one drink-driving conviction before the youth turned 15.

The next step was expanding this dataset into a monthly panel with 36 months before and after each youth's 18th birthday, covering the years between the ages 15-21. I created a variable called 'event' which is monthly time relative to turning 18, varying between -36 and 36 for each youth. This event-time specification allowed me to identify drink-driving offences relative to individuals' 18th birthday.

My final step was to merge the youth offences dataset to my panel through the youth's *snz_uid*. I linked drink-driving offences to the month in which the individual was formally proceeded against by police. I generated a binary variable that takes the value of one if the youth committed a drink-driving offence in that month, and zero otherwise.

4.7 Sample Description

The population of interest is 427,899 New Zealand youth born between 1996 and 2003. Table 2 presents socio-demographic characteristics broken down by parental drink-driving convictions. Overall, 94,419 individuals (22.1%) had at least one parent with a drink-driving conviction prior

to turning fifteen, while 333,480 (77.9%) had no such parental conviction.

The gender distribution is similar across both groups, with approximately 51% male and 49% female regardless of parental conviction status. However, substantial differences emerge across other socio-demographic characteristics.

The overall sample comprises 27.0% Māori and 73.0% non-Māori (combining European, Pacific, Asian, MELAA, and other ethnicities). Māori youth are substantially overrepresented among those with parental drink-driving convictions: 50.1% of youth with parental convictions are Māori, compared to only 20.4% of those without parental convictions.

Regarding geographic location, 63.7% of individuals live in urban areas and 36.3% in rural areas overall. Youth with parental convictions are slightly more likely to live in rural areas (38.2%) compared to those without parental convictions (35.8%).

In terms of socioeconomic background, as measured by the NZ Deprivation Index, 44.6% of the full sample resides in high-deprivation areas (NZ Deprivation Index >6) and 55.4% in low-deprivation areas (≤6). However, 63.3% of youth with parental convictions live in high-deprivation areas compared to only 39.2% of those without parental convictions. This indicates that youth with parental drink-driving convictions are substantially more likely to come from disadvantaged socioeconomic backgrounds.

Table 2. Descriptive Statistics

		parental background of drink driving	
		with conviction	no conviction
Population	Totals		
Gender			
Male	51.3%	51.4%	51.3%
Female	48.7%	48.6%	48.7%
Ethnicity			
Māori	27.0%	50.1%	20.4%
non-Māori	73.0%	49.9%	79.6%
Location			
Urban	63.7%	61.8%	64.2%
Rural	36.3%	38.2%	35.8%
NZ Deprivation Index			

>6	44.6%	63.3%	39.2%
=<6	55.4%	36.7%	60.8%
Individuals	427,899	94,419	333,480
		(22.1%)	(77.9%)

Notes: NZ Deprivation Index >6 indicates for highly deprived residential areas. The percentages are based on New Zealand administrative data from the Integrated Data Infrastructure (IDI), and are the author's own calculations.

4.8 Drink-driving Offence Patterns

Drink-driving offences increase as youth approach adulthood but start to decrease in their early twenties. The four scatter plots in Figure 2 display the mean drink-driving offence rates across ages 15 to 21, with red dashed vertical lines marking the key legal age thresholds of 16, 18, and 20. The top left plot displays mean drink-driving offence rates for males with no parental drink-driving convictions, while the top right plot displays the same for males with at least one parent with a drink-driving conviction. The bottom left and bottom right plots mirror this structure for females, showing offence rates for females without and with parental drink-driving convictions respectively. The offence rates differ considerably across the four groups. Males consistently show higher mean drink-driving offence rates than females across all ages, suggesting that gender plays an important role in shaping drink-driving behaviour. Youth with at least one parent with a drink-driving conviction show substantially higher offence rates than those without, for both males and females. This pattern is visible across all age thresholds and is consistent with the hypothesis that parental drink-driving behaviour is positively associated with youth drink-driving offending, which this thesis investigates further through regression analysis.

In all plots, drink-driving offences are almost absent before age 16, which is expected given that this is the minimum legal age to apply for the Learner's licence. Following the age 16 threshold, offence rates begin to rise gradually, reflecting increasing access to driving. The most pronounced jump, however, occurs around age 18, where all four plots show a visibly sharp increase in mean drink-driving offences. This is consistent with the legal threshold at which young people in New Zealand gain unrestricted access to alcohol through the Minimum Legal Purchase Age (MLPA). Around age 20, three of the four plots show a notable decline in offence rates, which aligns with the zero-alcohol limit that applies to drivers under 20 in New Zealand being replaced by the standard adult limit.

Table 3 presents drink-driving offence rates broken down by socio-demographic characteristics and parental convictions. Overall, 13,851 of youth out of the total 427,899 population of interest committed a drink-driving offence between the ages 15-21, resulting in an offence rate of 3.24%. When we break the population by background of parental convictions, youth with parental drink-driving convictions have an offence rate of 6.59%, almost three times the rate of 2.29% for those without parental convictions. The offence rate is only 0.20% at ages 15-17, rising to 1.55% at ages 17-19 and 2.09% at ages 19-21. This age gradient is consistent across both parental conviction groups, though youth with parental convictions consistently offend at higher rates within each age band. The ratio of offence rates between those with and without parental convictions is highest at the youngest ages (4.83 at ages 15-17) and declines to 2.87 at ages 19-

21, suggesting that the influence of parental convictions may be strongest during early adolescence.

Table 3: Descriptive Statistics

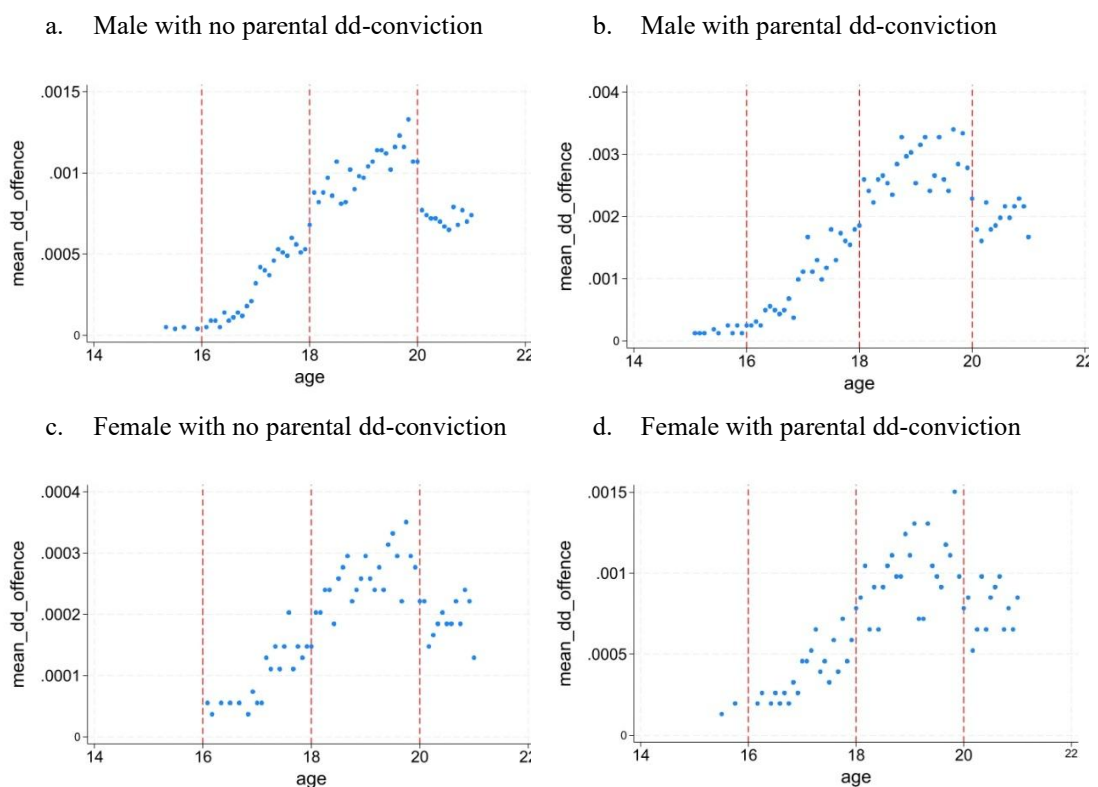
		Parental drink driving		Ratio
		with conviction	no conviction	
Youth drink-driving offences	Totals	3.24%	6.59%	2.88
Socio-demographic characteristics				
Age				
15-17	0.20%	0.51%	0.11%	4.83
17-19	1.55%	3.31%	1.05%	3.16
19-21	2.09%	4.24%	1.48%	2.87
Gender				
Male	4.81%	9.29%	3.53%	2.63
Female	1.59%	3.73%	0.98%	3.80
Ethnicity				
Māori	5.72%	8.19%	3.99%	2.05
non-Māori	2.32%	4.97%	1.85%	2.69
Location				
Urban	2.80%	6.02%	1.92%	3.14
Rural	4.11%	7.56%	3.05%	2.48
NZ Deprivation Index				
>6	4.18%	7.05%	2.85%	2.47
≤6	2.55%	5.85%	1.98%	2.95
Individuals	427,899	94,419	333,480	

Notes: Offence rates represent the proportion of youth who committed at least one drink-driving offence between the ages of 15- 21. The percentages are based on New Zealand administrative data from the Integrated Data Infrastructure (IDI), and are the author's own calculations.

Males have substantially higher offence rates than females overall (4.81% versus 1.59%). Interestingly, the ratio of offence rates between those with and without parental convictions is higher for females (3.80) than for males (2.63).

Rural youth have higher offence rates than urban youth (4.11% versus 2.80%). This rural-urban difference persists within both parental conviction groups. Māori youth have higher offence rates than non-Māori youth (5.72% versus 2.32%), and this difference also persists within both parental conviction groups. Youth in high-deprivation areas have higher offence rates than those in low-deprivation areas (4.18% versus 2.55%), again consistent across parental conviction groups. Across the all three socio-demographic categories youth with parental drink-driving convictions have substantially higher offence rates than comparable youth without parental convictions. The magnitude of this difference (ratios ranging from 2.05 to 4.83) suggests that parental convictions are a strong predictor of youth drink-driving behaviour, even after accounting for other observable characteristics.

Figure 2: Age-specific drink-driving offence profiles in New Zealand



Notes: The figure shows age-specific drink-driving offence rates by gender and parental conviction status. Overall, 13,851 of youth out of the total 427,899 population of interest committed a drink-driving offence between the ages 15-21. Estimates are based on New Zealand administrative data from the Integrated Data Infrastructure (IDI), and are the author's own calculations.

4.9 Cohort-Level Variation

Table 4 presents drink-driving offence rates across birth cohorts from 1996 to 2003, broken down by gender, parental convictions, and three age bands: 15-17, 17-19, and 19-21 years. The cohort sizes range from approximately 25,600 to 28,000 individuals per cohort, with a total sample of 219,429 males and 208,467 females. Across all cohorts, both genders, and all age groups, youth with parental convictions show higher offending rates than those without parental convictions. Males with parental convictions consistently show higher offending rates than females with parental convictions across all age groups and cohorts. For example, in the 1996 cohort, males with parental convictions aged 19-21 had an offence rate of 5.82% compared to 2.33% for females. However, among those without parental convictions, gender differences are smaller and more variable across cohorts, with males still generally showing slightly higher rates than females.

There is a clear increase by age in drink-driving offences across all subgroups. Offending rates are lowest in the youngest age group (15-17 years) and increase progressively through the 17-19 and 19-21 age bands. This pattern holds consistently across genders and parental conviction groups. For example, among males with parental convictions in the 1996 cohort, rates increase from 1.15% at ages 15-17, to 4.72% at ages 17-19, and to 5.82% at ages 19-21. The youngest age group shows particularly low rates, typically below 1% across most categories, while the oldest age group shows rates that are several times higher. The increase in offending rates as individuals age likely reflects greater access to both vehicles and alcohol at older ages.

The offence rates across birth cohorts decline over time. For example, among males with parental convictions aged 19-21, the rate declined from 5.82% in the 1996 cohort to 5.34% in the 2003 cohort. This is observable across most age-gender-parental conviction groups, though the decline is not uniform across all categories.

Table 4: Share of drink-driving offending

		Parental background with Conviction						Conviction						
		no conviction						no conviction						
		MALE						FEMALE						
	Cohort size	Age at 15-17	17-19	19-21	15-17	17-19	19-21	Cohort size	Age at 15-17	17-19	19-21	15-17	17-19	19-21
1996	27636	1.15	4.72	5.82	0.28	1.91	2.48	25956	0.52	2.03	2.33	0.15	0.57	0.61
1997	27480	0.96	4.96	6.41	0.25	1.60	2.26	26211	0.31	1.53	2.51	0.07	0.41	0.69
1998	27414	0.77	4.44	5.36	0.11	1.59	2.24	25770	0.45	1.52	2.20	0.04	0.44	0.67
1999	27318	0.38	4.61	5.28	0.10	1.60	2.22	26109	0.28	1.77	1.85	0.03	0.43	0.60
2000	28011	0.68	4.43	4.71	0.12	1.52	1.86	26451	0.28	1.72	2.14	0.04	0.46	0.51
2001	27033	0.42	3.80	5.11	0.07	1.38	2.08	26136	0.20	1.68	2.08	0.04	0.35	0.56
2002	26868	0.47	3.86	5.41	0.10	1.37	1.79	25608	0.27	1.22	2.02	0.03	0.36	0.44
2003	27669	0.44	3.86	5.34	0.11	1.25	2.13	26226	0.03	1.28	1.96	0.03	0.29	0.48
Total	219429							208467						

Notes: The table shows the cohort size and share of youth drink-driving offences at ages 15-17, 17-19 and 19-21 per year of birth cohort for males and females according to their parental background of drink-driving conviction. The percentages are based on New Zealand administrative data from the Integrated Data Infrastructure (IDI), and are the author's own calculations.

5. Methodology

The objective of this thesis is to estimate the causal effect of crossing legal age thresholds on youth drink-driving offending in New Zealand, and to examine whether this effect varies by parental drink-driving conviction history. The underlying identification strategy exploits the fact that the age thresholds of 16, 18, and 20 generate sharp and exogenous changes in youth legal rights. At 16, youth gain access to a Learner's licence. At 18, they gain the Minimum Legal Purchase Age (MLPA) alongside a range of legal transitions into adulthood. At 20, the zero-alcohol limit is replaced by the standard adult blood alcohol limit. This chapter describes the regression discontinuity (RD) design used to identify these causal effects, the empirical specification, the identification assumptions, and the heterogeneity analyses.

5.1 Potential Outcomes and Causal Identification

The underlying framework for estimating any causal effect stems from the potential outcomes model first set out by Rubin (1974). The potential outcomes model is expressed as,

$$\Delta_{ct}^{pg} = Y_{ct}^{pg}(\text{post}_t = 1) - Y_{ct}^{pg}(\text{post}_t = 0) \quad (1)$$

Where Δ_{ct}^{pg} is the causal effect of crossing the threshold for date-of-birth cohort c at event-time month t for parental conviction group p and gender group g . The $Y_{ct}^{pg}(\text{post}_t = 1)$ is the drink-driving offending rate after crossing the threshold, and $Y_{ct}^{pg}(\text{post}_t = 0)$ is the counterfactual, the offending rate that would have been observed had the threshold not been crossed. The threshold crossing is formally defined in equation (2).

The fundamental challenge of causal identification is that the same cohort cannot be observed in both states at the same time. The counterfactual $Y_{ct}^{pg}(\text{post}_t = 0)$ is unobservable for cohorts that have crossed the threshold, meaning the causal effect Δ_{ct}^{pg} cannot be directly calculated. I address this by using a regression discontinuity design, described in Section 5.2, which exploits the sharp and exogenous nature of the legal age thresholds to identify their causal effect on youth drink-driving offending.

5.2 Regression Discontinuity Design

A simple comparison of drink-driving offending rates before and after each age threshold would not identify a causal effect, as offending rates change continuously with age regardless of the legal threshold. Youth who are older are exposed to more driving situations and, at ages approaching 18, increasingly likely to consume alcohol, so a naive comparison would conflate the causal effect of crossing the threshold with the underlying age trend in offending. The regression discontinuity design addresses this by comparing youth just below and just above each threshold, who are similar in all relevant characteristics other than their legal status. This comparison isolates the causal effect of crossing the threshold from the smooth age gradient (Lee and Lemieux, 2010).

In a sharp RD, treatment status changes deterministically at the threshold: all units above receive the treatment, and all units below do not. The identifying assumption is that potential outcomes vary smoothly through the threshold in the absence of treatment, so that any discontinuous jump in the outcome at the cut-off is attributable to the treatment itself. The thresholds of 16, 18, and 20 satisfy these conditions. They are universal across New Zealand and occur on each youth's birthday, meaning treatment status changes at a precise and exogenous point. The running variable is age measured in months relative to each birthday, normalised to zero in the birthday month, with negative values preceding and positive values following the birthday. The causal parameter of interest is the LATE at each threshold, identified in the neighbourhood of the cut-off.

5.3 Empirical Specification

Following Bindler et al. (2024), I collapsed the data from the individual to the cohort level, grouping youth by birth year, gender, and parental conviction status. The outcome variable Y is the mean offending rate for each date-of-birth cohort in a month, measured as the proportion of youth who commit a drink-driving offence. A youth is counted as offending in a month if they were formally proceeded against by police for a drink-driving offence in that month, as recorded in the NZ Police pre-count offenders' dataset; multiple offences within a month are counted once.

The running variable t is defined as age in months relative to each birthday, normalised to zero in the birthday month. In this sharp RD design, treatment status is a deterministic function of t , where the indicator variable post_t is defined as:

$$\text{post}_t = \begin{cases} 1 & \text{if } t \geq 0 \\ 0 & \text{if } t < 0 \end{cases} \quad (2)$$

The analysis is conducted separately for each of the three age thresholds and for each of four subgroups defined by gender and parental conviction status, with estimation restricted to a bandwidth of ± 11 months around each cut-off. The main empirical specification is:

$$Y_{ct}^{pg} = \beta_0 + \beta_1 t + \beta_2 \text{post}_t + \beta_3 (\text{post}_t \times t) + \beta_4 \text{bday}_t + \Sigma(\gamma_c \text{cohort}_c) + \varepsilon_{ct}^{pg} \quad (3)$$

In particular:

- Y_{ct}^{pg} is the mean of drink-driving offences by youth in date-of-birth cohort c at event-time month t for parental conviction group p and gender group g .
- β_0 represents the baseline intercept, or the estimated mean offending rate for the cohort exactly at the threshold $t = 0$ from the left (pre-birthday) side, before the legal treatment is applied.
- β_1 is the coefficient for the baseline linear time trend, which captures the smooth monthly change in offending as youth age, before the birthday threshold.
- β_2 is the coefficient capturing the discrete jump in the mean offending rate at the birthday, the intent-to-treat effect (ITT) estimate of the causal effect of crossing the legal age threshold. post_t is a binary indicator equal to 1 once the cohort has crossed the age threshold ($t \geq 0$) and 0 before.
- β_3 is the coefficient for the interaction between post_t and the time trend t , which allows the slope of the age trend to differ after the birthday compared to before it.
- β_4 is a binary indicator for the birthday month ($t = 0$), included to isolate temporary celebration effects from the permanent level shift captured by β_2 .
- $\Sigma(\gamma_c \text{cohort}_c)$ is a vector of year-of-birth fixed effects that controls for the broad cohort-level decline in youth drink-driving offending.
- ε_{ct}^{pg} is the error term with mean zero.

The model is estimated using OLS with heteroscedasticity-robust standard errors. Three points are important for the interpretation of β_2 : First, as all New Zealand youth become eligible for the relevant legal rights at exactly ages 16, 18, and 20, the design is sharp. Since not all youth exercise these rights immediately, β_2 captures the ITT effect rather than the effect of actual take-up. Second, β_2 captures the reduced-form effect of the entire bundle of legal rights granted at each threshold rather than the effect of any single right in isolation. At 18, youth simultaneously gain MLPA purchasing rights and, for many, eligibility to sit the full driving licence test, alongside a range of other legal transitions including the move from Youth Court to adult court jurisdiction. Second, β_2 captures the reduced-form effect of the entire bundle of rights granted at each threshold rather than the effect of any single right in isolation. Third, the RD design identifies the local average treatment effect (LATE) at the cut offs, at which the rights are gained².

5.4 Identification Assumptions

RD designs require three identification assumptions. First, manipulation of treatment assignment is impossible because date of birth is predetermined. This eliminates endogenous sorting around the cutoff, strengthening RD validity.

Second, no other major policy or institutional change that would affect youth drink-driving offending coincides with the age thresholds of 16, 18, and 20 in New Zealand. At 18, they simultaneously gain MLPA purchasing rights and, for many, eligibility to sit the full driving licence test, alongside a range of other legal transitions including the move from Youth Court to adult court jurisdiction. The thresholds of 16, 18, and 20 correspond to specific and well-defined legal changes in New Zealand, and no other major policy or institutional change coincides with these cut-offs. The inclusion of $\beta_1 t$ and $\beta_3(\text{post}_t \times t)$ in equation (3) controls for any smooth pre-existing age trend in offending on either side of each threshold, so that β_2 identifies the discrete jump at the cut-off net of these trends.

² LATE is typically reserved for instrumental variable (IV) approaches and fuzzy RD designs, in which the LATE is the treatment effect for compliers whose treatment status responds to the instrument. However, in our study we do not apply an RDD/IV framework but instead a cohort-based parametric regression discontinuity design.

The third assumption is that youth do not alter their behaviour in anticipation of crossing a legal age threshold before it occurs. If youth were to adjust their drink-driving behaviour in advance of a birthday threshold, the measured pre-birthday trend would reflect anticipatory behaviour rather than a smooth age trend, and the estimate of β_2 would be biased. In the context of this thesis, this assumption is plausible. Legal age thresholds in New Zealand apply universally and automatically on each youth's birthday, and there is no mechanism through which a youth could access the relevant legal right before the threshold date. The split linear specification in equation (3) explicitly models the pre-birthday trend, allowing any smooth anticipatory age gradient to be absorbed by $\beta_1 t$ rather than attributed to the threshold effect. In my main analysis this means that $\beta_2 \text{post}_t = 0$ for all the pre-birthday periods, as $\text{post}_t = 0$ when $t < 0$, and any significant pre-birthday trend is captured by $\beta_1 t$ rather than attributed to the threshold.

5.5 Heterogeneity Analysis

In addition to the main results, I conduct heterogeneity analyses stratified by three characteristics: the NZ Deprivation Index, the Urban-Rural Indicator, and ethnicity. For each stratification variable, I split the sample into two groups: high versus low deprivation ($\text{NZDep2023} > 6$ versus ≤ 6), rural versus urban, and Māori versus non-Māori, and re-estimate equation (3) separately within each stratum, allowing all parameters to differ freely.

The ethnicity heterogeneity analysis divides the sample into Māori and non-Māori youth. This division is motivated by the overrepresentation of Māori in both drink-driving offending and parental conviction history reported in Chapter 4. Māori comprise 27.0% of the total sample but account for 50.1% of youth with parental drink-driving convictions, compared to 20.4% of those without, and have an overall offence rate of 5.72% compared to 2.32% for non-Māori. These disparities justify treating Māori as a distinct stratum in the heterogeneity analysis.

5.6 Addressing Endogeneity

A potential concern in any study of legal age thresholds is whether the estimates capture genuine causal effects or are confounded by endogenous factors. In the regression discontinuity design used in this thesis, endogeneity is addressed by construction. The running variable is age measured in months relative to each birthday threshold, which is determined by date of birth and is therefore fixed, exogenous, and cannot be manipulated by the youth or by any other agent. This rules out selection into treatment as a source of bias. A further concern is whether unobserved individual characteristics that are correlated with drink-driving propensity change discontinuously at the age thresholds. This is addressed by the identifying assumption that

potential outcomes vary smoothly through each threshold in the absence of treatment. As discussed in Section 5.3, this assumption is plausible in the New Zealand institutional context given that no other policy or legal change coincides with the specific thresholds of 16, 18, and 20.

The cohort-level aggregation approach further reduces endogeneity concerns. By grouping youth into date-of-birth cohorts rather than estimating at the individual level, idiosyncratic individual-level shocks are averaged out within cohorts, and the identifying variation comes from the cohort-level discontinuity at each threshold rather than from individual-level differences in behaviour. The inclusion of year-of-birth fixed effects controls for cohort-level differences in baseline offending rates, ensuring that the threshold estimates are not confounded by the secular decline in youth drink-driving offending across successive birth cohorts documented in Chapter 4.

6. Results

This chapter presents the reduced-form intent-to-treat (ITT) estimates from the sharp parametric regression discontinuity design. I constructed a cohort-level panel grouping youth by birth year, gender, and parental conviction status. The outcome variable is the mean of drink-driving offence rate by youth a in a month between the ages of 15 and 21. I used parametric OLS with a split linear trend on either side of each birthday threshold, following Bindler et al. (2024). The age thresholds of 16, 18, and 20 were treated as generating sharp and exogenous changes in youth rights, and the coefficient of interest β_2 in equation (1) identifies the local average treatment effect (LATE) of crossing each threshold in the neighbourhood of the cut-off.

Table 5 presents the main results disaggregated by gender and by parental drink-driving conviction status. Effects are expressed as changes in the mean of offending rate relative to the underlying age trend, indexed by months relative to the relevant birthday, where month 0 refers to the birthday month. I used a bandwidth of plus or minus 11 months on each side of the birthday threshold, covering a 23-month window around each cut-off, and included heteroscedasticity-robust standard errors. Year-of-birth fixed effects are included to control for cohort-level differences in baseline offending rates, ensuring that the threshold estimates reflect genuine behavioural responses to the legal age thresholds rather than the broader secular decline in youth drink-driving offending across successive birth cohorts.

Section 6.1.1 presents the relative change in the likelihood of drink-driving offending for male and female youth across all three age thresholds, as displayed in .

Figure 3. Rather than reporting the absolute OLS coefficients from Table 5, the predicted likelihood of offending is indexed to the month before each birthday threshold, expressing the results as relative changes and allowing the trajectories of the two parental background groups to be compared directly regardless of differences in baseline offending rates.

Section 6.1.2 examines birth cohort trends in baseline offending rates, documenting how drink-driving offending has evolved across successive birth cohorts over the sample period. Section 6.2 provides a summary of main results. Sections 6.3, 6.4, and 6.5 present heterogeneity analyses stratified by NZ Deprivation Index, Urban-Rural Indicator, and ethnicity, with results reported in Tables 5, 6, and 7 respectively.

6.1 Main Results: Discontinuities in Youth Drink-Driving Offending

In this section, I present the regression discontinuity estimates reported in Table 5 for all four subgroups: males without parental drink-driving convictions (column 1), males with parental drink-driving convictions (column 2), females without parental drink-driving convictions (column 3), and females with parental drink-driving convictions (column 4).

Male Youth

Age 16 Threshold (ages 15–17):

In the months approaching the 16th birthday, the pre-birthday trend (Trend: pre-BD) coefficient for males without parental drink-driving conviction is 0.00000257 (SE = 0.00000102). Expressed as a percentage of their mean of 0.00144, following Bindler et al. (2024), this corresponds to a relative monthly increase of 0.18% in youth drink-driving offences, and is significant at the 5% level, suggesting a modest upward trajectory in offending in the months before gaining the Learner's licence. For males with parental drink-driving conviction, the Trend: pre-BD coefficient is 0.00000445 (SE = 0.0000052), representing a relative monthly offending increase of 0.07% of their mean of 0.00655, and is not significant at the 10% level. These estimates, along with all subsequent coefficients and standard errors, are reported in Table 5 panel(a).

The AGE 16 (=1/0) coefficient which captures any immediate level shift in offending at the birthday month is -0.00000202 (SE = 0.0000175) for males without parental drink-driving conviction and 0.00002060 (SE = 0.0000676) for males with parental drink-driving conviction, representing changes of -0.1% and 0.3% of their respective means. Neither is significant at the 10% level, confirming the absence of an immediate level shift at the Learner's licence threshold for either group.

The Birthday month effect, capturing the temporary effect of birthday celebrations on drink-driving offending, is -0.00000438 (SE = 0.0000219) for males without parental drink-driving conviction and 0.00005800 (SE = 0.0000922) for males with parental drink-driving conviction, representing -0.3% and 0.9% of their respective means. Neither is significant at the 10% level, indicating no evidence that birthday celebrations temporarily elevate drink-driving offending for either parental background group at the age 16 threshold.

In the months following the 16th birthday, the post-birthday trend (Trend: post-BD) coefficient, which captures the acceleration in offending after the birthday over and above the pre-birthday trend, is positive and highly significant at the 1% level for both groups: 0.0000109 (SE =

0.00000297) for males without parental drink-driving conviction, representing an additional monthly increase of 0.76% relative to their mean in offending, and 0.0000436 (SE = 0.000011) for males with parental drink-driving conviction, representing an additional monthly increase of 0.67%. These correspond to approximately 8 additional drink-driving offences per 1,000 male youth per month after turning 16 for those without parental drink-driving conviction, and approximately 7 for those with parental drink-driving conviction. Since the baseline mean offending rate is 1.44 per 1,000 for males without parental drink-driving conviction and 6.55 per 1,000 for those with parental drink-driving conviction, adding the post-birthday acceleration brings the total monthly rate to approximately 9 per 1,000 and 14 per 1,000 respectively. In absolute terms, the post-birthday trend is four times larger for males with parental drink-driving conviction than for those without, meaning parental drink-driving conviction history substantially amplifies the rate at which drink-driving offending increases following the Learner's licence threshold.

Age 18 Threshold (ages 17-19):

In the months approaching the 18th birthday and the minimum legal purchasing age (MLPA), the pre-birthday trend coefficient is positive and highly significant at the 1% level for both groups: 0.0000165 (SE = 0.00000513) for males without parental drink-driving conviction, representing a relative monthly increase of 0.11% of their mean of 0.015, and 0.0000468 (SE = 0.0000171) for males with parental drink-driving conviction, representing a relative monthly increase of 0.11% of their mean of 0.043. Both groups show a similar relative monthly increase in the months approaching the birthday, suggesting drink-driving offending was already rising before unrestricted alcohol access was gained.

The AGE 18 (=1/0) coefficient, which captures any immediate level shift in offending at the birthday month, is 0.000274 (SE = 0.0000603) for males without parental drink-driving conviction, representing an increase of 1.8% relative to their mean of 0.015, and 0.000526 (SE = 0.00019) for males with parental drink-driving conviction, representing an increase of 1.2% relative to their higher mean of 0.043, nearly double in absolute terms. Both are significant at the 1% level, confirming an immediate and significant level shift in drink-driving offending at the MLPA threshold for both groups. These correspond to approximately 18 additional drink-driving offences per 1,000 male youth for those without parental drink-driving conviction and approximately 12 for those with parental drink-driving conviction. Since the baseline mean offending rate is 15.3 per 1,000 for males without parental drink-driving conviction and 43.2 per 1,000 for those with parental drink-driving conviction, adding the level shift brings the total monthly rate to approximately 33 per 1,000 and 55 per 1,000 respectively.

The Birthday month effect is negative and significant at the 5% level for males without parental drink-driving conviction (-0.000178 , $SE = 0.000082$), representing a temporary decrease of 1.2% relative to their mean in the birthday month itself, consistent with birthday celebrations occurring in contexts that do not involve driving. For males with parental drink-driving conviction, the Birthday month effect is -0.000389 ($SE = 0.000253$), representing a decrease of 0.9% relative to their mean, and is not significant at the 10% level.

In the months following the 18th birthday, the post-birthday trend coefficient is -0.00000830 ($SE = 0.00000853$) for males without parental drink-driving conviction, representing -0.054% of their mean, and 0.0000222 ($SE = 0.000029$) for males with parental drink-driving conviction, representing 0.051% of their mean. Neither is significant at the 10% level. The absence of a significant post-birthday trend confirms that gaining unrestricted alcohol access at 18 represents a permanent level shift rather than a continuing change in trajectory.

Age 20 Threshold (ages 19-21):

As the youth approach the 20th birthday and the transition from the zero-alcohol limit to the standard adult alcohol limit, the pre-birthday trend coefficient is 0.0000134 ($SE = 0.00000729$) for males without parental drink-driving conviction, representing a relative monthly increase of 0.06% of their mean of 0.021, and is marginally significant at the 10% level. For the male youth with parental drink-driving conviction, the pre-birthday trend coefficient is 0.00000847 ($SE = 0.0000231$), representing a relative monthly increase of 0.02% of their mean of 0.054, and is not significant at the 10% level. Both lines are trending slightly upward in the months before the birthday, before the pattern reverses entirely at the threshold.

The AGE 20 ($=1/0$) coefficient captures a sharp and significant level shift decrease in drink-driving offending for both groups. It is -0.000482 ($SE = 0.0000661$) for males without parental drink-driving conviction, representing a level shift decrease of 2.2% relative to their mean of 0.021, and -0.00124 ($SE = 0.000201$) for males with parental drink-driving conviction, representing a level shift decrease of 2.3% relative to their higher mean of 0.054, more than twice as large in absolute terms. Both are significant at the 1% level. These correspond to a reduction of approximately 22 drink-driving offences per 1,000 male youth for both groups. Since the baseline mean offending rate is 22 per 1,000 for males without parental drink-driving conviction and 54 per 1,000 for those with parental drink-driving conviction, this level shift decrease brings the total monthly rate to approximately 21 per 1,000 and 31 per 1,000 respectively. This sharp level shift decrease reflects the reclassification of previously illegal low-level drink-driving as legal under the standard adult blood alcohol limit rather than a genuine reduction in drink-driving behaviour.

The Birthday month effect, capturing the temporary effect of birthday celebrations on drink-driving offending, is positive and highly significant at the 1% level for males without parental drink-driving conviction (0.000315, SE = 0.000091), representing a temporary increase of 1.5% relative to their mean in the birthday month itself, and positive and significant at the 5% level for males with parental drink-driving conviction (0.000587, SE = 0.000249), representing a temporary increase of 1.1% relative to their mean. This temporary upward birthday month effect is consistent with birthday celebrations where alcohol consumption is elevated, before the level shift decrease takes hold in the following month.

In the months following the 20th birthday, the post-birthday trend coefficient is -0.0000150 (SE = 0.00000956) for males without parental drink-driving conviction, representing -0.070% of their mean, and 0.0000369 (SE = 0.0000303) for males with parental drink-driving conviction, representing 0.068% of their mean. Neither is significant at the 10% level. Despite their similar insignificance, the two coefficients move in opposing directions.

Female Youth

Female youth have substantially lower baseline drink-driving offending rates than males across all three age thresholds. For youth without parental drink-driving conviction, the female mean offending rate is approximately one third of the male mean at age 16, and around one quarter at ages 18 and 20. For youth with parental drink-driving conviction, the female mean is approximately half the male mean at age 16, and around one third at ages 18 and 20. This difference in baseline offending rates should be kept in mind when comparing the magnitude of the threshold effects across genders.

At the age 16 threshold, as with males, no significant level shift is observed for either female parental background group. However, unlike males where the post-birthday trend is highly significant for both parental background groups, for females it is significant only for those with parental drink-driving conviction. The absolute magnitude of the post-birthday trend is also considerably smaller for females, corresponding to approximately 2 to 4 additional offences per 1,000 female youth per month compared to 7 to 8 for males.

At the age 18 threshold, the contrast with males is most pronounced. While males show a significant and immediate level shift upon gaining unrestricted alcohol access at the MLPA for both parental background groups, no significant level shift is observed for females in either group. The pre-birthday trend and post-birthday trend are also insignificant for both female groups at this threshold, unlike males where both are significant.

At the age 20 threshold, females align with males in showing a significant level shift decrease for both parental background groups, making this the only threshold where the responses of males and females converge. However, the absolute magnitude of the level shift decrease is considerably smaller for females, consistent with their lower baseline offending rates. As with males, the level shift decrease is larger in absolute terms for those with parental drink-driving conviction than for those without, and the post-birthday trend coefficients move in opposing directions for the two female parental background groups, though neither reaches significance.

6.1.1 Relative Change in the Likelihood of Drink-Driving Offending

To compare the changes in youth behaviour from two different parental backgrounds across the three age thresholds, I displayed the relative change in the likelihood of drink-driving in offending in Figure 3. Using the OLS coefficients from equation 1 in Table 5, Figure 3 indexes the predicted likelihood of offending to the month before each birthday threshold, where the value in the month before the birthday (month -1) is set as the reference point at 1, rather than reporting the absolute OLS coefficients. Values above 1 indicate that the likelihood of offending is higher than in the reference month, while values below 1 indicate that it is lower. This allows the pre-birthday trend, the level shift at the birthday, and the post-birthday trend to be read directly from the figure as changes relative to the month before each threshold. By setting both groups to the same reference point, the level effects are removed, allowing the trajectories of the two parental background groups to be compared directly regardless of their different baseline offending rates.

For both male and female youth, the lines for the different parental background groups follow a similar change at each threshold. At age 16, the lines for both parental background rise after the birthday at a broadly similar rate, with only a small divergence at the birthday month itself. At age 18, both lines show a sharp upward jump at the birthday and then stabilise at a similar pace. At age 20, both lines drop sharply at the birthday before diverging slightly in the months that follow. Figure 3 therefore reveals that the two parental background groups respond to each legal age threshold in the same direction and with a broadly similar relative trajectory. What differs is the absolute magnitude of the response, which is captured in Table 5. While Table 5 quantifies the size of the effects in absolute terms, Figure 3 shows that the pattern of drink-driving response reaching the three age-thresholds is structurally similar across both parental background groups.

Table 5. Regression Discontinuity Estimates: Age Thresholds and Youth Drink-Driving Offending

Y: share of drink-driving offences by youth				
Panel (a) Age threshold Parents drink-driving conviction:	Males 16		Females 16	
	No	with	no	With
	(1)	(2)	(3)	(4)
AGE 16 (=1/0)	-0.00000202 (0.0000175)	0.00002060 (0.0000676)	0.00001480 (0.0000114)	0.00002250 (0.0000468)
Trend: pre-BD	0.00000257** (0.00000102)	0.00000445 (0.0000052)	0.000000936* (0.000000546)	0.00000240 (0.00000356)
Trend: post-BD	0.0000109*** (0.00000297)	0.0000436*** (0.000011)	0.00000119 (0.00000173)	0.0000129* (0.00000744)
Birthday month effect	-0.00000438 (0.0000219)	0.00005800 (0.0000922)	-0.00001030 (0.0000145)	-0.00006510 (0.0000507)
Mean of Y	0.00144	0.00655	0.00050	0.00301
Panel (b) Age threshold Parents drink-driving conviction:	Males 18		Females 18	
	No	with	no	With
	(1)	(2)	(3)	(4)
AGE 18 (=1/0)	0.000274*** (0.0000603)	0.000526*** (0.00019)	0.00004400 (0.0000309)	0.00016600 (0.000115)
Trend: pre-BD	0.0000165*** (0.00000513)	0.0000468*** (0.0000171)	0.00000431 (0.00000268)	0.00000870 (0.0000103)
Trend: post-BD	-0.00000830 (0.00000853)	0.00002220 (0.000029)	0.00000071 (0.00000455)	0.00002760 (0.0000172)
Birthday month effect	-0.000178** (0.000082)	-0.00038900 (0.000253)	-0.0000649* (0.0000364)	0.00008480 (0.000147)
Mean of Y	0.01531	0.04322	0.00417	0.01588
Panel (c) Age threshold Parents drink-driving conviction:	Males 20		Females 20	
	No	with	no	With
	(1)	(2)	(3)	(4)
AGE 20 (=1/0)	-0.000482*** (0.0000661)	-0.00124*** (0.000201)	-0.000145*** (0.0000342)	-0.000455*** (0.000134)
Trend: pre-BD	0.0000134* (0.00000729)	0.00000847 (0.0000231)	0.00000422 (0.00000397)	0.00002400 (0.000015)
Trend: post-BD	-0.00001500 (0.00000956)	0.00003690 (0.0000303)	0.00000065 (0.00000519)	-0.00002250 (0.0000191)
Birthday month effect	0.000315*** (0.000091)	0.000587** (0.000249)	0.00005730 (0.0000429)	0.00001560 (0.000149)
Mean of Y	0.02146	0.05411	0.00568	0.02130
Bandwidth	+/-11 months			
Year-of-birth FEs	Yes	Yes	Yes	Yes
Individuals represented (N)	170,910	48,519	162,552	45,915
Ses	Robust	Robust	Robust	Robust

Note: The regression outcome is the share of young people in each birth-year $\times$ event-month $\times$ sex $\times$ parental-conviction group with at least one recorded drink-driving proceeding in that month. Coefficients are changes in this monthly share. “Share with ≥ 1 offence in age window” is an individual-level measure over the corresponding age band, not the mean of the monthly regression outcome. N counts individuals represented before aggregation, not the number of cohort-month observations.

AGE 16/18/20 (=1/0) is the key coefficient of interest, capturing the sharp jump or decline in offending at each threshold. Standard errors are robust and shown in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Estimates are based on NZ administrative data from the (IDI),

and are the author's own calculations.

6.1.2 Birth Cohort Trends in Baseline Offending

Following Bindler et al. (2024), year-of-birth fixed effects are included in the baseline specification to control for cohort-level differences in baseline offending rates, with the 1996 birth cohort serving as the reference category. Across all three thresholds, the fixed effects reveal a broad and consistent downward trend in baseline offending rates across successive birth cohorts, most pronounced at the age 16 threshold and weakest at the age 20 threshold, and strongest for females without parental drink-driving conviction at age 16. These cohort trends are reported alongside the threshold estimates in Table 5, and by accounting for them, the threshold estimates reflect genuine behavioural responses to the legal age thresholds rather than the broader secular decline in youth drink-driving offending over the sample period.

Age 16 threshold (ages 15–17):

At the age 16 threshold, the birth year fixed effects reveal a consistent and statistically significant downward trend in baseline offending rates across later birth cohorts for nearly all groups. For males without parental drink-driving conviction, cohorts born from 1998 onwards have significantly lower baseline offending rates than the 1996 reference cohort, ranging from -5.4% to -7.0% of the mean across cohorts 1998–2003. The decline is more pronounced for males with parental drink-driving conviction, where cohorts 1999 to 2003 show significantly lower baseline rates ranging from -3.6% to -5.3% of the mean. For females without parental drink-driving conviction, the downward trend is the most consistent and significant across all cohorts from 1997 onwards, ranging from -8.1% to -12.2% of the mean. For females with parental drink-driving conviction, the pattern is less consistent, with significant reductions observed for the 1997, 1999, 2000, 2001, 2002 and 2003 cohorts.

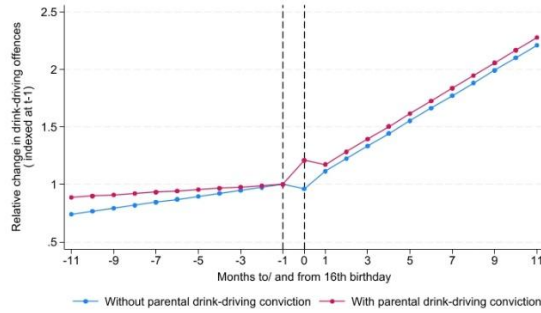
Age 18 threshold (ages 17–19):

At the age 18 threshold, the cohort fixed effects show a similar downward pattern, though the magnitudes are smaller relative to the mean given the higher baseline offending rates at this threshold. For males without parental drink-driving conviction, all cohorts from 1997 to 2003 have significantly lower baseline rates than the 1996 cohort, with the decline increasing for later cohorts from -1.1% of the mean for the 1997 cohort to -2.0% for the 2003 cohort. For males with parental drink-driving conviction, significant reductions are observed only for the 2001, 2002 and 2003 cohorts. For females without parental drink-driving conviction, the largest reductions are found for the 2001, 2002 and 2003 cohorts (-2.4% to -3.0% of the mean). For females with

parental drink-driving conviction, significant reductions are observed only for the 2002 and 2003 cohorts.

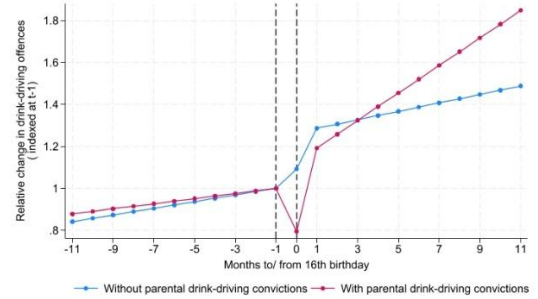
Figure 3. Relative changes in youth drink-driving at ages 16, 18, 20

(a) Males

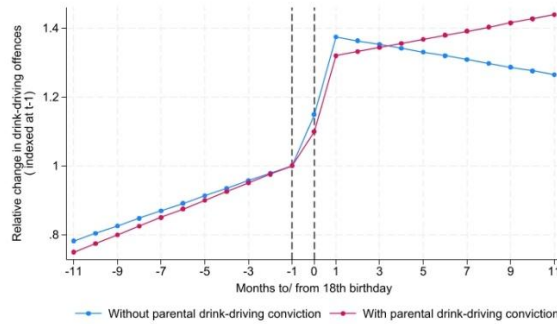


Age16

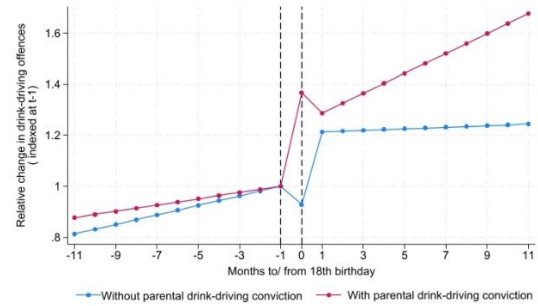
(b) Females



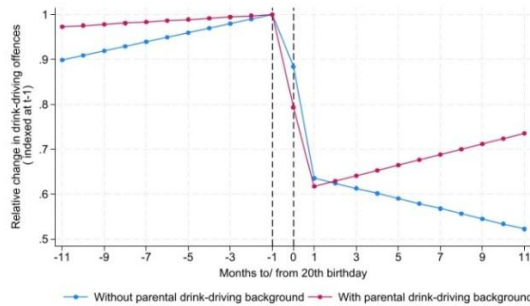
Age16



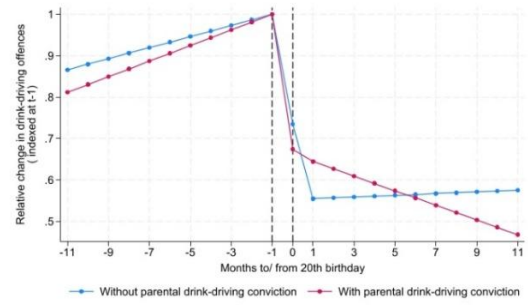
Age18



Age18



Age20



Age20

Notes: The figure reports the relative changes in the likelihood of drink-driving offending using the OLS coefficients from equation 1 in Table 5. Estimates are based on New Zealand administrative data from the Integrated Data Infrastructure (IDI), and are the author's own calculations.

Age 20 threshold (ages 19–21):

At the age 20 threshold, the cohort fixed effects are less consistent and smaller in magnitude than at the younger thresholds. For males without parental drink-driving conviction, significant negative cohort effects are observed for the 1999, 2000, 2001, 2002 and 2003 cohorts, ranging from -0.5% to -1.3% of the mean. For the remaining groups, significant cohort effects are sparse,

suggesting the cross-cohort decline in baseline offending weakens at older ages.

Across all three panels, the birth year fixed effects confirm a broad downward trend in baseline drink-driving offending rates across successive birth cohorts, most pronounced at the age 16 threshold and weakest at the age 20 threshold. By including these fixed effects, the main threshold estimates are identified net of these cohort-level trends, meaning the discontinuities identified in this analysis reflect genuine responses to the age thresholds rather than the broader decline in youth drink-driving offending over the sample period.

6.2 Summary of the Main Results

Across all three age thresholds, youth with parental drink-driving conviction consistently show larger absolute responses than those without, for both males and females. At age 16, the post-birthday acceleration in offending is four times larger in absolute terms for those with parental conviction. At age 18, the level shift is nearly double, and at age 20 the level shift decrease is more than twice as large. However, when baseline offending differences are removed as demonstrated in Figure 3, the relative trajectories of the two parental background groups follow a broadly similar pattern at each threshold, suggesting that parental conviction history does not alter the relative behavioural response pattern. The year-of-birth fixed effects in Section 6.1.2 confirm that these threshold effects reflect genuine behavioural responses rather than the broad secular decline in youth drink-driving offending observed across successive birth cohorts.

6.3 Heterogeneity by the NZ Deprivation Index

This section presents regression discontinuity estimates stratified by NZ Deprivation Index, examining whether threshold effects vary by socioeconomic disadvantage. Table 6 reports estimates separately for youth in less deprived areas ($\text{NZDep}_{2023} \leq 6$) and more deprived areas ($\text{NZDep}_{2023} > 6$) across all three thresholds. The baseline specification is estimated separately within each stratum, with percentage interpretations calculated using stratum-specific means.

Male youth in more deprived areas have consistently higher baseline offending rates than those in less deprived areas across all three thresholds and both parental background groups. At age 16, no level shift is observed in either stratum. The post-birthday acceleration is present for males with parental conviction in both strata, confirming that parental conviction history amplifies the post-birthday response regardless of deprivation context. At age 18, the level shift is larger for males with parental conviction than for those without in both strata. In less deprived areas, the coefficient for males with parental conviction (0.00071417) is more than twice that for those without (0.00030005). In more deprived areas the difference between parental background groups

is smaller. At age 20, the decline is present for all groups in both strata. The coefficient for male youth with parental conviction is 2.2 times larger in more deprived areas (-0.00150422) than in less deprived areas (-0.00069732), meaning socioeconomic disadvantage and parental conviction history together are most strongly associated with the reclassification effect.

Female youth in more deprived areas have consistently higher baseline offending rates than those in less deprived areas, consistent with the male pattern. At age 16, no level shift is observed in either stratum. The post-birthday acceleration is small and broadly similar across strata and parental background groups. At age 18, no significant level shift is observed for either parental background group in either stratum, though the coefficient for females with parental conviction is four times larger in more deprived areas (0.00020487, 1.20% of mean) than in less deprived areas (0.00004331, 0.34% of mean). At age 20, the decline is present for all groups in both strata. Unlike males, the coefficient for females with parental conviction is larger in less deprived areas (-0.00062063, 4.2% of mean) than in more deprived areas (-0.00037858, 1.7% of mean). Within each stratum, the coefficient for females with parental conviction is consistently larger than for those without, four times larger in less deprived areas and three times larger in more deprived areas.

Across all three thresholds, parental conviction history amplifies youth offending responses regardless of socioeconomic context. At age 18, the amplifying effect of parental conviction is stronger for males in less deprived areas. At age 20, the reclassification decline is universal, but the interaction between deprivation and parental conviction history is strongest for males in more deprived areas, and for females the pattern reverses, with the larger decline observed in less deprived areas.

6.4 Heterogeneity by the Urban rural indicator

Table 7 reports regression discontinuity estimates stratified by Urban-Rural Indicator, examining whether threshold effects vary by geographic location.

Male youth in rural areas have consistently higher baseline offending rates than those in urban areas across all three thresholds and both parental background groups. At age 16, no level shift is observed in either stratum. The post-birthday acceleration is present for both parental background groups in both strata but is substantially larger in rural areas, nearly four times larger for males without parental conviction (0.00002091 rural versus 0.00000542 urban) and approximately twice as large for those with parental conviction (0.00006215 rural versus 0.00003222 urban). Within each stratum, the amplifying effect of parental conviction history is present in both areas, with the ratio between parental background groups larger in urban areas (nearly six times) than in rural

areas (three times). At age 18, the level shift is larger in rural areas than urban areas for both parental background groups. The rural coefficient for males without parental conviction (0.00054525, 2.59% of mean) is more than four times the urban equivalent (0.00012904, 1.06% of mean). For those with parental conviction, the rural coefficient (0.00073260) is 1.7 times larger than the urban equivalent (0.00042372). Within urban areas, the difference between parental background groups is more pronounced, with the coefficient for those with parental conviction more than three times larger than for those without. At age 20, the decline is present for all groups in both strata. Unlike the other two thresholds, the decline for males with parental conviction is considerably larger in urban areas (-0.00146873, 3.19% of mean) than in rural areas (-0.00074817, 1.25% of mean), meaning the reclassification effect at age 20 is most strongly associated with parental conviction history in urban environments.

Female youth in rural areas have higher baseline offending rates than those in urban areas, mirroring the male pattern. At age 16, no level shift is observed in either stratum. The post-birthday acceleration is small and broadly similar across strata and parental background groups. At age 18, no significant level shift is observed for either parental background group in either stratum, consistent with the main results for females. At age 20, the decline is present for all groups in both strata. Unlike males, the female pattern is broadly similar across geographic strata. In both rural and urban areas, the coefficient for females with parental conviction is approximately three times larger than for those without (-0.00062804 versus -0.00019774 in rural areas; -0.00036804 versus -0.00012645 in urban areas).

Parental conviction history amplifies youth offending responses in both geographic strata. At age 16, the post-birthday acceleration is larger in rural areas for males, suggesting geographic context shapes the magnitude of the response even as the amplifying effect of parental conviction operates regardless of location. At age 18, the level shift is larger in rural areas for males, particularly for those without parental conviction. At age 20, the pattern reverses for males, the reclassification decline is largest for those with parental conviction in urban areas while for females the decline is broadly similar across geographic strata and consistently larger for those with parental conviction than for those without.

6.5 Heterogeneity by Ethnicity

Table 8 reports regression discontinuity estimates stratified by ethnicity, examining whether threshold effects vary between Māori and non-Māori youth.

Māori male youth have consistently higher baseline offending rates than non-Māori male youth across all three thresholds and both parental background groups. At age 16, no level shift is

observed in either stratum. The post-birthday acceleration is present for males with parental conviction in both strata, 0.00004745 (0.54% of mean) for Māori youth and 0.00003695 (0.90% of mean) for non-Māori youth, and for males without parental conviction in both strata, though at smaller magnitudes. The amplifying effect of parental conviction history is present in both strata, with the ratio between parental background groups similar across Māori and non-Māori youth in relative terms. At age 18, the level shift is significant for Māori males in both parental background groups. For males without parental conviction, the coefficient is 0.00049035 (1.92% of mean) for Māori youth and 0.00021662 (1.71% of mean) for non-Māori youth, 2.3 times smaller in absolute terms, reflecting the substantially higher baseline offending rates of Māori youth. For males with parental conviction, the level shift is significant only for Māori youth (0.00068448, 1.34% of mean), while the non-Māori coefficient does not reach significance. At age 20, the decline is present and significant for all male groups in both strata. The absolute decline is consistently larger for Māori youth: for those without parental conviction, -0.00076604 (2.35% of mean) for Māori versus -0.00041476 (2.44% of mean) for non-Māori, 1.8 times smaller in absolute terms. For those with parental conviction, the coefficient is -0.00150858 (2.49% of mean) for Māori and -0.00091562 (2.23% of mean) for non-Māori, 1.6 times smaller. Within each stratum, the coefficient for males with parental conviction is consistently larger than for those without nearly twice as large for both Māori (1.97x) and non-Māori youth (2.21x).

Māori female youth have consistently higher baseline offending rates than non-Māori female youth, mirroring the male pattern. At age 16, no level shift is observed in either stratum. A marginally significant post-birthday acceleration is observed only for Māori females with parental conviction (0.00002139, 0.47% of mean). At age 18, no significant level shift is observed for either parental background group in either stratum, consistent with the main results for females. At age 20, the decline is present and significant for all female groups in both strata. The absolute decline is larger for Māori youth: for those without parental conviction, -0.00029901 (2.53% of mean) for Māori versus -0.00010210 (2.80% of mean) for non-Māori, nearly three times smaller in absolute terms. For those with parental conviction, the coefficient is -0.00054684 (2.12% of mean) for Māori and -0.00035765 (2.65% of mean) for non-Māori. Within each stratum, the coefficient for females with parental conviction is consistently larger than for those without — 1.8 times larger for Māori youth and 3.5 times larger for non-Māori youth — meaning the amplifying effect of parental conviction history is more pronounced for non-Māori females at this threshold.

Parental conviction history amplifies offending responses in both Māori and non-Māori strata. At age 16, the post-birthday acceleration is present for males with parental conviction regardless of ethnicity; for females only a marginal effect is observed for Māori youth with parental conviction.

At age 18, the level shift is larger in absolute terms for Māori males, reflecting their higher baseline rates, and is significant for non-Māori males only among those without parental conviction. At age 20, the decline is universal across all groups, consistently larger in absolute terms for Māori youth. The amplifying effect of parental conviction history at age 20 is more pronounced for non-Māori females (3.5 times) than for Māori females (1.8 times).

7. Discussion

7.1 Overview of key findings

This thesis examined whether the three legal age thresholds, the Learner's licence at 16, the minimum legal purchasing age (MLPA) at 18, and the transition to the standard adult blood alcohol limit at 20, produce discontinuous changes in youth drink-driving offending in New Zealand, and whether those responses differ by parental drink-driving conviction history, gender, socioeconomic deprivation, geographic location, and ethnicity. The regression discontinuity estimates reveal clear and significant behavioural responses at each threshold, but the interpretation of those responses depends on whether one examines absolute or relative changes in offending.

The central empirical finding is that youth with parental drink-driving conviction histories consistently exhibit larger absolute responses at every threshold, for both males and females, and across all heterogeneity strata. At age 16 the post-birthday acceleration in offending is approximately four times larger in absolute terms for males with parental conviction history than for those without; at age 18 the level shift upon gaining unrestricted alcohol access is nearly twice as large; and at age 20 the level shift decrease associated with reclassification of low-level drink-driving is more than twice as large. These patterns hold across deprivation, urban-rural, and ethnicity subgroups. Yet Figure 3 reveals that once baseline offending differences are removed by indexing both groups to their predicted likelihood of offending in the month before each threshold, the two parental background groups follow a broadly similar relative trajectory at each threshold. The divergence between absolute and relative responses has substantive implications both for how intergenerational transmission of drink-driving risk should be understood and for how policy interventions might be most effectively targeted.

7.2 Unpacking the absolute versus relative responses

The distinction between absolute and relative effects reflects two different questions about intergenerational risk. The absolute difference asks: how many additional drink-driving events does each threshold generate in each group? The relative question asks: does exposure to a legal threshold change the probability of offending by a proportionally larger or smaller amount for those with a parental conviction background?

The answer to the first question is unambiguous. Youth with parental drink-driving conviction histories enter each threshold window with materially higher baseline offending rates and leave each window having added substantially more absolute offences. This pattern is consistent with

the intergenerational transmission literature, which documents that parental drink-driving behaviour predicts offspring drink-driving outcomes through multiple channels including direct behavioural modelling, household norms that normalise alcohol use, and environmental and biological transmission pathways (Evans-Whipp et al., 2013; Hjalmarsson and Lindquist, 2010a, 2013; Kendler et al., 2018; Staff and Maggs, 2020). The higher baseline rates themselves are evidence that these mechanisms are operative well before any legal threshold is reached.

The answer to the second question is more nuanced. Once groups are placed on a common relative scale, the shape of the response to each threshold is structurally similar: both groups accelerate after age 16, both jump sharply at age 18, and both drop sharply at age 20. This convergence in relative trajectories suggests that legal thresholds function as behavioural triggers for all youth, irrespective of parental background. The mechanisms linking legal status to access to alcohol, drink-driving, changed perceived legitimacy of drinking, and increased exposure to driving contexts where alcohol is present appear to operate with similar proportional force regardless of family background. The larger absolute responses observed for youth with parental conviction histories reflect their higher starting point rather than a differential sensitivity to the threshold itself.

The absolute gap between parental background groups pre-exists the legal thresholds and widens at each one, because both groups respond in similar proportions to a threshold but from very different starting points. Policies that target the thresholds themselves, such as raising the MLPA or tightening the zero-alcohol limit for young drivers, may therefore reduce absolute offending across all groups but will not close the gap between different parental background groups unless they also address the background conditions that produce the elevated baseline.

7.3 Responses at Each Threshold

7.3.1 The Learner's Licence

The age 16 threshold does not produce a significant immediate level shift in offending for any group, which is consistent with the restrictive conditions attached to a Learner's licence in New Zealand: supervised driving only, zero-alcohol limit, and no independent access to a vehicle. What it does produce, for males, is a significant acceleration in the post-birthday trend, a gradual but sustained increase in the rate at which offending rises month by month. This is most plausibly understood as reflecting increased exposure to driving situations over time as licence holders accumulate supervised driving hours and their social contexts increasingly involve vehicles. The absence of an immediate jump is consistent with the graduated licensing system preventing the kind of acute post-birthday spike observed at the age 18 threshold.

For females, the post-birthday acceleration is significant only for those with parental conviction history, and is considerably smaller in absolute terms than for males. The gender gap at this threshold likely reflects both lower baseline driving exposure among females and differences in the social contexts in which young male and female drivers operate. The finding that females with parental conviction histories show a detectable post-birthday response while those without do not suggests that parental background elevates sensitivity to the licensing threshold even at this early stage, though the absolute magnitudes remain small.

7.3.2 The Minimum Legal Purchasing Age (MLPA)

The most notable threshold effect in the data is the sharp, permanent level shift in male drink-driving offending upon gaining unrestricted alcohol access at age 18. The absence of a significant post-birthday trend confirms that this is a step change rather than a continuing acceleration, consistent with the MLPA providing a qualitatively new drinking context that then becomes stable. This pattern closely parallels findings from the United States, where Carpenter and Dobkin (2015) document significant increases in drink-driving arrests at the minimum legal drinking age of 21 using a sharp regression discontinuity design, and from the Netherlands, where Bindler, et al. (2024) find increases in victimisation at the age-16 and age-18 alcohol access thresholds. The birthday month itself shows a temporary dip in offending for some groups, likely capturing celebration in non-driving contexts, before the higher level is sustained in subsequent months.

The absence of a significant level shift for females at age 18 is one of the most important gender differences in the results. This does not imply that females are unaffected by gaining unrestricted alcohol access; rather, it suggests that the pathway from alcohol access to drink-driving is more attenuated for females at this age, likely reflecting lower rates of unsupervised car access and different social contexts for alcohol consumption among 18-year-old women compared to men. The contrast with the age 20 threshold, where both genders show significant responses, is consistent with a convergence in driving risk exposure as youth age.

The larger absolute level shift for males with parental conviction history at age 18, nearly twice that of males without, is consistent with the interpretation that parental conviction history is associated with higher baseline alcohol consumption and drink-driving propensity prior to age 18, meaning the removal of the alcohol purchase restriction at 18 unlocks a larger absolute increase in offending for this group. However, as the relative trajectories in Figure 3 show, the MLPA threshold itself does not act differentially on the two groups in proportional terms; it adds a similar increment to a much higher starting point.

7.3.3 Reclassification and Its Implications

The transition at age 20 in New Zealand moves youth from the zero-alcohol limit to the standard adult limit of 50mg/100ml of blood, or 250mcg/L of breath. The sharp drop in measured drink-driving offences at this threshold is most plausibly attributable to reclassification: behaviour that was previously a drink-driving offence, specifically driving with a blood alcohol level above zero but below 50mg/100ml, ceases to be one at age 20. This is not a genuine reduction in impaired driving; it is a redefinition of what counts as impaired.

The reclassification interpretation is supported by three features of the data. First, the birthday month effect at age 20 is positive and significant for males, a temporary spike in offending in the month of turning 20, likely reflecting celebratory drinking, before the permanent level shift decrease takes hold, which is inconsistent with a genuine deterrence mechanism. Second, the level shift decrease is larger in absolute terms for those with parental conviction histories, who have higher baseline offending rates; under reclassification, those who were committing more low-level drink-driving prior to the threshold have the most to gain from the definitional change. Third, post-birthday trend coefficients for the two parental background groups move in opposite directions but neither is significant, suggesting an absence of genuine behavioural change in either direction post-threshold.

The reclassification interpretation carries an important methodological implication: observed declines in drink-driving offending at age 20 do not signal a genuine reduction in impaired driving.

7.4 Gender Differences

Gender differences are evident across all three thresholds. Female youth have substantially lower baseline offending rates than males across all threshold windows and parental background groups, and their responses to legal thresholds are generally smaller in absolute terms. The age 18 threshold produces no significant level shift for females in any subgroup, in contrast to males. At age 16 and age 20, female responses are structurally similar to males but attenuated in magnitude.

These gender differences are broadly consistent with international evidence. Males are consistently over-represented in drink-driving offence statistics, a gap that reflects both higher rates of alcohol consumption and higher rates of car use in contexts where alcohol is present. Keall, Frith and Patterson (2004) document that young male drivers in New Zealand face multiplicatively elevated crash risk relative to females at every blood alcohol level, consistent with males occupying higher-risk driving contexts. The notably larger male response at age 18 is plausibly linked to the social contexts of male drinking at this age: driving to and from nightlife venues and peer group norms that may be more tolerant of drink-driving risk among young men.

The amplifying effect of parental conviction history on threshold responses differs between males and females. For males, parental conviction history amplifies the absolute response at all three thresholds. For females, the amplifying effect of parental conviction history is present but more variable across thresholds, and the smaller absolute magnitudes mean the effects are less likely to reach statistical significance. Evans-Whipp et al. (2013) document that exposure to a drink-driving parent predicts offspring drink-driving outcomes for both genders, but the pathway from parental exposure to offending behaviour appears more strongly mediated by driving context for males than for females.

7.5 Heterogeneity by Deprivation, Geography, and Ethnicity

Heterogeneity analyses reveal that parental conviction history amplifies youth offending responses across all stratification dimensions: deprivation, urban-rural location, and ethnicity. Youth in more deprived areas and in rural areas show consistently higher baseline offending rates across all threshold windows and parental background groups. The rural findings reflect the structural reality of rural New Zealand, where car use is necessary rather than optional and alternatives to driving after drinking are often limited or unavailable. Christoffersen, Soothill and Francis (2008) document a similar rural gradient in Denmark, finding that living outside metropolitan areas is associated with a 50 percent higher probability of a first-time drink-driving conviction, attributing this to limited public transport infrastructure. The interaction between rural residence and parental conviction history in the present results produces the largest absolute threshold responses in the data.

Māori youth have higher baseline drink-driving offending rates than non-Māori youth across all threshold windows and are disproportionately represented among youth with parental conviction histories in the sample. These patterns are consistent with the Māori Road Safety Outcomes Report, which documents that Māori drivers, particularly young Māori men, are over-represented in alcohol-impaired crash deaths and serious injuries in New Zealand (Waka Kotahi, 2021). The notable level shift for Māori males at the MLPA, significant for both parental background groups, reflects the compounding of elevated baseline offending risk.

Across all three heterogeneity dimensions, the relative trajectories at each threshold remain broadly similar for both parental background groups within each stratum, consistent with the main finding that legal thresholds propagate a pre-existing absolute gap rather than creating differential relative responses.

7.6 Secular Decline in Youth Drink-Driving

The birth cohort fixed effects confirm a broad and consistent downward trend in baseline drink-driving offending rates across successive cohorts. This decline is strongest at the age 16 threshold and weakest at age 20. The pattern is consistent with the interpretation that New Zealand's graduated licensing reforms and broader road safety improvements have been most effective at reducing entry into drink-driving behaviour, as these changes primarily targeted new drivers. By age 20, youth who were going to offend have typically already done so, and the cohort trend in baseline offending is correspondingly weaker. The threshold estimates in this analysis are identified net of these secular trends through the inclusion of cohort fixed effects, ensuring that the discontinuities reflect genuine behavioural responses to legal age thresholds rather than the broader improvement in youth road safety over the sample period.

7.7 Limitations and Future Directions

This analysis has two main limitations. First, the outcome variable captures only detected and recorded offending. Changes in policing intensity or detection probability around age thresholds could in principle affect the measured discontinuities, though there is no institutional basis to expect such changes to coincide with the specific thresholds examined. This concern is partially mitigated by the inclusion of cohort fixed effects, which absorb year-level variation in enforcement.

Second, the parental conviction variable is a binary indicator of whether either parent had a drink-driving conviction before the youth turned 15. This does not capture the severity, recency, or number of parental convictions, whether the convicted parent was primarily resident in the household, or undetected parental drink-driving behaviour.

8. Conclusion

This thesis set out to answer two questions: do legal age thresholds change youth drink-driving behaviour in New Zealand, and does the answer differ depending on whether a young person has grown up in a household with a parent convicted of drink-driving? My regression discontinuity estimates show that the answer to both questions is yes, but the findings require careful interpretation.

Legal thresholds matter. The age 16 Learner's licence generates a sustained post-birthday acceleration in male drink-driving offending. The age 18 minimum legal purchasing age generates a sharp, permanent level shift in male offending, consistent with the international evidence from Carpenter and Dobkin (2015) and Bindler et al.(2024) that gaining legal alcohol access at age thresholds produces measurable increases in alcohol-related offending. And the age 20 transition to the standard adult alcohol limit generates a sharp level shift decrease, though one that reflects the reclassification of previously illegal low-level drink-driving rather than a genuine reduction in impaired driving.

Parental conviction history matters, but in a specific way. Youth with parental drink-driving conviction histories exhibit larger absolute responses at every threshold. They enter each threshold window having already offended at substantially higher rates, and they leave having added more absolute offences. This is the fundamental finding about intergenerational transmission in this study, and it is consistent with the evidence from Hjalmarsson and Lindquist (2010a) that children of convicted drink-drivers face substantially elevated rates of drink-driving convictions themselves, with the relationship concentrated precisely in the adolescent and young adult years when legal thresholds are being crossed. Yet the relative trajectories, how much each group's offending changes proportionally at each threshold, are broadly similar. Legal thresholds do not appear to act differentially on the two parental background groups in relative terms.

This distinction between the absolute and relative dimensions of the parental background effect implies that threshold-level policies, while valuable, will not close the gap between parental background groups on their own. The elevated baseline from which the high-risk group starts is the primary driver of the absolute gap, and reducing that baseline requires interventions that reach youth and their families before the first legal threshold arrives. A parent's drink-driving conviction is a moment of contact between a high-risk household and the justice system; it is also a signal that their children may be on a trajectory toward higher drink-driving risk. These trajectories are established through processes operating in the household well before the age at which they become visible in offending data.

The heterogeneity analyses show that the compounding of risk factors is a recurrent theme. Rural youth face structurally higher drink-driving risk because driving is obligatory and alternatives are scarce, consistent with the rural gradient documented by Christoffersen, Soothill and Francis (2008) in the Danish context. Māori youth face the largest absolute threshold responses, reflecting the compounding of elevated baseline offending risk and disproportionate representation among youth with parental conviction histories. These patterns align with the Māori Road Safety Outcomes Report published by Waka Kotahi (2021), which documents the over-representation of young Māori men in alcohol-impaired road crash deaths and serious injuries in New Zealand.

The secular decline in baseline drink-driving rates across successive birth cohorts provides an encouraging context for these findings. New Zealand's graduated licensing system and broader road safety improvements over the sample period have been effective at reducing the general level of youth drink-driving. But the persistence of large absolute gaps between parental background groups, and the fact that legal thresholds continue to shape youth drink-driving behaviour, suggest that overall progress has not eliminated the differential risk faced by the most vulnerable young drivers.

This thesis provides the first regression discontinuity evidence on the causal effects of three legal age thresholds on youth drink-driving offending in New Zealand, and on whether parental drink-driving conviction history amplifies those effects, estimated at ages 16, 18, and 20 using linked administrative microdata. A key analytical contribution is the distinction between absolute and relative threshold responses, which shows that failing to distinguish between the two produces misleading conclusions about whether parental background moderates the effect of legal thresholds. The threshold effects are situated within a broader picture of cohort trends, gender differences, and geographic and ethnic heterogeneity in New Zealand.

The household environment in which a young person grows up shapes their drink-driving risk well before any legal threshold is reached. The evidence in this thesis suggests that the consequences of that environment compound at each successive legal threshold they cross. The legal thresholds of age 16, 18 and 20 are moments at which a pre-existing gap becomes newly visible in offending data. What makes those moments matter for research and policy is everything that happened before them.

This thesis shows that legal age thresholds meaningfully shape youth drink-driving offending, particularly at age 18 when access to alcohol increases sharply. However, legal thresholds alone do not explain disparities in offending risk. Youth exposed to parental drink-driving convictions consistently offend at higher rates, suggesting that intergenerational transmission operates through behavioural and environmental pathways established well before legal access to driving

or alcohol. Effective prevention therefore requires policy interventions that combine age-based regulation with earlier, family-focused prevention strategies targeted at high-risk households.

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Appendix

Table 6. Heterogeneity by NZ Deprivation Index:

a. Age threshold 16

Sample Age threshold Parents drink- driving conviction:	Y: share of drink-driving offences by youth			
	Males 16		Females 16	
	No	with	no	with
	(1)	(2)	(3)	(4)
NZDep2023 ≤ 6				
AGE 16 (=1/0)	-0.00001567 (0.00001942)	0.00006572 (0.00008520)	0.00002545* (0.00001430)	0.00009294 (0.00005748)
Trend: pre-BD	0.00000160 (0.00000124)	0.00000261 (0.00000541)	0.00000528 (0.00000051)	-0.00000573 (0.00000482)
Trend: post-BD	0.00001176*** (0.00000344)	0.00003637*** (0.00001391)	-0.00000076 (0.00000198)	0.00001006 (0.00000948)
Birthday month effect	-0.00000126 (0.00001979)	0.00012653 (0.00014087)	-0.00000037 (0.00002235)	-0.00009183* (0.00005202)
Mean of Y	0.00116	0.00521	0.0004	0.00208
NZDep2023 > 6				
AGE 16 (=1/0)	0.00001690 (0.00003131)	0.00001115 (0.00009687)	-0.00000125 (0.00002118)	-0.00002143 (0.00006659)
Trend: pre-BD	0.00000416** (0.00000164)	0.00000528 (0.00000774)	0.00000278** (0.00000114)	0.00000757 (0.00000504)
Trend: post-BD	0.00000945* (0.00000518)	0.00004773*** (0.00001610)	0.00000388 (0.00000344)	0.00001462 (0.00001021)
Birthday month effect	-0.00000631 (0.00004783)	0.00000901 (0.00011783)	-0.00002581 (0.00001859)	-0.00004962 (0.00007450)
Mean of Y	0.00191	0.00719	0.00074	0.0034
Bandwidth	+/-11 months			
Year-of-birth Fes	Yes	Yes	Yes	Yes
N	170,910	48,519	162,552	45,915
SEs	Robust	Robust	Robust	Robust

Notes: NZDep2023 ≤ 6 represents less deprived areas and NZDep2023 > 6 represents more deprived areas. AGE 16 (=1/0) is the key coefficient of interest. Standard errors are robust and shown in parentheses. ***p<0.01, **p<0.05, *p<0.1.

Estimates are based on New Zealand administrative data from the Integrated Data Infrastructure (IDI), and are the author's own calculations.

b. Age threshold 18

Y: share of drink-driving offences by youth				
Sample Age threshold Parents drink-driving conviction:	Males 18		Females 18	
	no (1)	with (2)	no (3)	with (4)
NZDep2023 ≤ 6				
AGE 18 (=1/0)	0.00030005*** (0.00007126)	0.00071417** (0.00031405)	0.00004642 (0.00003676)	0.00004331 (0.00016500)
Trend: pre-BD	0.00000513 (0.00000626)	0.00005205* (0.00002717)	0.00000397 (0.00000336)	0.00001388 (0.00001589)
Trend: post-BD	0.00000612 (0.00001039)	-0.00000682 (0.00004723)	-0.00000229 (0.00000545)	0.00001309 (0.00002521)
Birthday month effect	-0.00011860 (0.00009589)	-0.00065853* (0.00039870)	-0.00006593 (0.00004678)	0.00042320 (0.00025851)
Mean of Y	0.01369	0.0407	0.00331	0.01284
NZDep2023 > 6				
AGE 18 (=1/0)	0.00023790** (0.00010538)	0.00038766 (0.00024044)	0.00004963 (0.00005178)	0.00020487 (0.00015216)
Trend: pre-BD	0.00003490*** (0.00000849)	0.00004377* (0.00002257)	0.00000417 (0.00000453)	0.00000562 (0.00001340)
Trend: post-BD	-0.00003305** (0.00001497)	0.00004399 (0.00003642)	0.00000400 (0.00000761)	0.00003947* (0.00002293)
Birthday month effect	-0.00029990** (0.00014286)	-0.00023017 (0.00032341)	-0.00007594 (0.00006340)	-0.00007982 (0.00018434)
Mean of Y	0.01782	0.04338	0.00545	0.01701
Bandwidth	+/-11 months			
Year-of-birth FEs	Yes	Yes	Yes	Yes
N	170,910	48,519	162,552	45,915
SEs	Robust	Robust	Robust	Robust

Notes: NZDep2023 ≤ 6 represents less deprived areas and NZDep2023 > 6 represents more deprived areas. AGE 18 (=1/0) is the key coefficient of interest. Standard errors are robust and shown in parentheses. ***p<0.01, **p<0.05, *p<0.1. Estimates are based on New Zealand administrative data from the Integrated Data Infrastructure (IDI), and are the author's own calculations.

c. Age threshold 20

Sample Age threshold Parents drink-driving conviction:	Y: share of drink-driving offences by youth			
	Males 20		Females 20	
	no (1)	with (2)	no (3)	with (4)
NZDep2023 ≤ 6				
AGE 20 (=1/0)	-0.00039949*** (0.00008873)	-0.00069732** (0.00033554)	-0.00015684*** (0.00004381)	-0.00062063*** (0.00020564)
Trend: pre-BD	0.00000739 (0.00000987)	-0.00003059 (0.00003969)	0.00001181** (0.00000477)	0.00005423** (0.00002165)
Trend: post-BD	-0.00001567 (0.00001288)	0.00004396 (0.00005066)	-0.00001002 (0.00000626)	-0.00004964* (0.00002886)
Birthday month effect	0.00033148*** (0.00011056)	0.00038088 (0.00038801)	-0.00000161 (0.00004915)	-0.00011599 (0.00020711)
Mean of Y	0.01793	0.0457	0.00411	0.0149
NZDep2023 > 6				
AGE 20 (=1/0)	-0.00058870*** (0.00010648)	-0.00150422*** (0.00026101)	-0.00012935** (0.00005535)	-0.00037858** (0.00017163)
Trend: pre-BD	0.00001985 (0.00001230)	0.00002924 (0.00002924)	-0.00000472 (0.00000650)	0.00000844 (0.00001965)
Trend: post-BD	-0.00001620 (0.00001561)	0.00002565 (0.00003863)	0.00001152 (0.00000868)	-0.00000889 (0.00002499)
Birthday month effect	0.00030005** (0.00014368)	0.00066367** (0.00032378)	0.00012705 (0.00008176)	0.00006766 (0.00020529)
Mean of Y	0.02312	0.0538	0.0068	0.0222
Bandwidth	+/-11 months			
Year-of-birth FEs	Yes	Yes	Yes	Yes
N	170,910	48,519	162,552	45,915
SEs	Robust	Robust	Robust	Robust

Notes: NZDep2023 ≤ 6 represents less deprived areas and NZDep2023 > 6 represents more deprived areas. AGE 20 (=1/0) is the key coefficient of interest. Standard errors are robust and shown in parentheses. ***p<0.01, **p<0.05, *p<0.1. Estimates are based on New Zealand administrative data from the Integrated Data Infrastructure (IDI), and are the author's own calculations.

Table 7. Heterogeneity by Urban-Rural Indicator:

a. Age threshold 16

Y: share of drink-driving offences by youth				
Sample Age threshold Parents drink-driving conviction:	Males 16		Females 16	
	no (1)	with (2)	no (3)	with (4)
Rural				
AGE 16 (=1/0)	-0.00000243 (0.00003581)	0.00007747 (0.00011616)	0.00000582 (0.00001842)	-0.00006571 (0.00007184)
Trend: pre-BD	0.00000187 (0.00000182)	-0.00000210 (0.00000910)	0.00000081 (0.00000099)	0.00000263 (0.00000682)
Trend: post-BD	0.00002091*** (0.00000615)	0.00006215*** (0.00002019)	0.00000240 (0.00000290)	0.00001766 (0.00001194)
Birthday month effect	0.00003419 (0.00005259)	-0.00003389 (0.00013750)	-0.00000386 (0.00002406)	0.00002052 (0.00008197)
Mean of Y	0.00213	0.00708	0.00057	0.00276
Urban				
AGE 16 (=1/0)	-0.00000357 (0.00001936)	-0.00000406 (0.00008188)	0.00002035 (0.00001393)	0.00007661 (0.00006188)
Trend: pre-BD	0.00000306*** (0.00000117)	0.00000848 (0.00000660)	0.00000124** (0.00000063)	0.00000209 (0.00000393)
Trend: post-BD	0.00000542* (0.00000312)	0.00003222** (0.00001293)	0.00000029 (0.00000207)	0.00001044 (0.00000950)
Birthday month effect	-0.00002547 (0.00001939)	0.00011766 (0.00012840)	-0.00001409 (0.00001879)	-0.00011742* (0.00006684)
Mean of Y	0.00108	0.00608	0.00051	0.00301
Bandwidth	+/-36 months			
Year-of-birth FEs	Yes	Yes	Yes	Yes
N	170,910	48,519	162,552	45,915
SEs	Robust	Robust	Robust	Robust

Notes: This table presents heterogeneity results by Urban-Rural Indicator. Rural represents areas outside major and large urban areas. Urban represents major and large urban areas. AGE 16 (=1/0) is the key coefficient of interest. Standard errors are robust and shown in parentheses. ***p<0.01, **p<0.05, *p<0.1. Estimates are based on New Zealand administrative data from the Integrated Data Infrastructure (IDI), and are the author's own calculations.

b. Age threshold 18

Y: share of drink-driving offences by youth				
Sample Age threshold Parents drink-driving conviction:	Males 18		Females 18	
	no (1)	with (2)	no (3)	with (4)
Rural				
AGE 18 (=1/0)	0.00054525*** (0.00011798)	0.00073260** (0.00036066)	0.00008521 (0.00006222)	0.00024209 (0.00020440)
Trend: pre-BD	0.00000763 (0.00001038)	0.00008442*** (0.00003240)	0.00000310 (0.00000558)	0.00001153 (0.00001796)
Trend: post-BD	0.00000188 (0.00001730)	-0.00003598 (0.00005398)	0.00000327 (0.00000944)	0.00001701 (0.00003106)
Birthday month effect	-0.00019446 (0.00015694)	-0.00057894 (0.00048173)	-0.00006535 (0.00008118)	0.00031087 (0.00029707)
Mean of Y	0.02103	0.05133	0.00516	0.0175
Urban				
AGE 18 (=1/0)	0.00012904* (0.00006725)	0.00042372* (0.00022042)	0.00002776 (0.00003554)	0.00010236 (0.00013278)
Trend: pre-BD	0.00002276*** (0.00000568)	0.00002303 (0.00001923)	0.00000485* (0.00000293)	0.00000710 (0.00001285)
Trend: post-BD	-0.00001367 (0.00000961)	0.00006119* (0.00003289)	0.00000016 (0.00000515)	0.00003813* (0.00002029)
Birthday month effect	-0.00018915** (0.00009266)	-0.00029975 (0.00027444)	-0.00007235* (0.00004148)	-0.00001065 (0.00017426)
Mean of Y	0.01213	0.03695	0.00357	0.01432
Bandwidth	+/-36 months			
Year-of-birth FEs	Yes	Yes	Yes	Yes
N	170,910	48,519	162,552	45,915
SEs	Robust	Robust	Robust	Robust

Notes: This table presents heterogeneity results by Urban-Rural Indicator. Rural represents areas outside major and large urban areas. Urban represents major and large urban areas. AGE 18 (=1/0) is the key coefficient of interest. Standard errors are robust and shown in parentheses. ***p<0.01, **p<0.05, *p<0.1. Estimates are based on New Zealand administrative data from the Integrated Data Infrastructure (IDI), and are the author's own calculations.

c. Age threshold 20

Y: share of drink-driving offences by youth				
Sample Age threshold Parents drink-driving conviction:	Males 20		Females 20	
	no (1)	with (2)	no (3)	with (4)
Rural				
AGE 20 (=1/0)	-0.00057560*** (0.00014338)	-0.00074817** (0.00037296)	-0.00019774** (0.00007729)	-0.00062804** (0.00024398)
Trend: pre-BD	0.00000554 (0.00001562)	-0.00006062 (0.00004280)	0.00000341 (0.00000868)	0.00003996 (0.00002741)
Trend: post-BD	-0.00001931 (0.00002081)	0.00009825* (0.00005591)	0.00001035 (0.00001165)	-0.00003102 (0.00003492)
Birthday month effect	0.00026611 (0.00018320)	0.00069175 (0.00050511)	0.00006958 (0.00011127)	0.00001411 (0.00025961)
Mean of Y	0.02777	0.05977	0.00668	0.02053
Urban				
AGE 20 (=1/0)	-0.00044481*** (0.00007497)	-0.00146873*** (0.00023840)	-0.00012645*** (0.00003719)	-0.00036804** (0.00015963)
Trend: pre-BD	0.00001881** (0.00000827)	0.00004683* (0.00002764)	0.00000539 (0.00000430)	0.00001650 (0.00001817)
Trend: post-BD	-0.00001668 (0.00001080)	-0.00000627 (0.00003543)	-0.00000468 (0.00000553)	-0.00002007 (0.00002288)
Birthday month effect	0.00033912*** (0.00010136)	0.00051054* (0.00030046)	0.00006253 (0.00004683)	-0.00002260 (0.00017513)
Mean of Y	0.01655	0.04609	0.00477	0.01927
Bandwidth	+/-36 months			
Year-of-birth FEs	Yes	Yes	Yes	Yes
N	170,910	48,519	162,552	45,915
SEs	Robust	Robust	Robust	Robust

Notes: This table presents heterogeneity results by Urban-Rural Indicator. Rural represents areas outside major and large urban areas. Urban represents major and large urban areas. AGE 20 (=1/0) is the key coefficient of interest. Standard errors are robust and shown in parentheses. ***p<0.01, **p<0.05, *p<0.1. Estimates are based on New Zealand administrative data from the Integrated Data Infrastructure (IDI), and are the author's own calculations.

Table 8. Heterogeneity by Ethnicity:**a. Age threshold 16**

Y: share of drink-driving offences by youth				
Sample Age threshold Parents drink-driving conviction:	Males 16		Females 16	
	no (1)	with (2)	no (3)	with (4)
Māori				
AGE 16 (=1/0)	-0.00001946 (0.00005087)	0.00011466 (0.00011441)	0.00001595 (0.00003579)	0.00000527 (0.00008229)
Trend: pre-BD	0.00000738** (0.00000343)	0.00000302 (0.00000908)	0.00000248 (0.00000233)	0.00000417 (0.00000642)
Trend: post-BD	0.00001430* (0.00000830)	0.00004745** (0.00001857)	0.00000541 (0.00000565)	0.00002139* (0.00001288)
Birthday month effect	0.00001151 (0.00007940)	-0.00004943 (0.00014453)	-0.00005278* (0.00003136)	-0.00010716 (0.00008288)
Mean of Y	0.002759	0.00882	0.00118	0.00456
non-Māori				
AGE 16 (=1/0)	-0.00000024 (0.00001779)	-0.00005795 (0.00007029)	0.00001382 (0.00001030)	0.00004143 (0.00004024)
Trend: pre-BD	0.00000136 (0.00000084)	0.00000635 (0.00000506)	0.00000056 (0.00000036)	0.00000047 (0.00000269)
Trend: post-BD	0.00001021*** (0.00000295)	0.00003695*** (0.00001213)	0.00000018 (0.00000152)	0.00000465 (0.00000626)
Birthday month effect	-0.00000608 (0.00001945)	0.00015420 (0.00012169)	0.00000091 (0.00001608)	-0.00001822 (0.00005941)
Mean of Y	0.001121	0.00409	0.00036	0.00127
Bandwidth	+/-36 months			
Year-of-birth FEs	Yes	Yes	Yes	Yes
N	170,910	48,519	162,552	45,915
SEs	Robust	Robust	Robust	Robust

Notes: This table presents heterogeneity results by ethnicity. Māori represents youth identified as Māori in the APC constants dataset and non-Māori if ethnicity information is provided but not Māori stated. AGE 16 (=1/0) is the key coefficient of interest. Standard errors are robust and shown in parentheses. ***p<0.01, **p<0.05, *p<0.1. Estimates are based on New Zealand administrative data from the Integrated Data Infrastructure (IDI), and are the author's own calculations.

b. Age threshold 18

Y: share of drink-driving offences by youth				
Sample	Males		Females	
Age threshold	18		18	
Parents drink-driving conviction:	no	with	no	with
	(1)	(2)	(3)	(4)
Māori				
AGE 18 (=1/0)	0.00049035*** (0.00017017)	0.00068448** (0.00028811)	0.00009337 (0.00010324)	0.00016198 (0.00018828)
Trend: pre-BD	0.00003277** (0.00001493)	0.00005565** (0.00002603)	0.00000674 (0.00000890)	0.00001310 (0.00001746)
Trend: post-BD	-0.00002765 (0.00002433)	0.00003298 (0.00004293)	-0.00000082 (0.00001502)	0.00003402 (0.00002855)
Birthday month effect	-0.00044786** (0.00019641)	-0.00016315 (0.00039849)	-0.00009940 (0.00013601)	0.00009188 (0.00024663)
Mean of Y	0.0255	0.05099	0.00933	0.02144
non-Māori				
AGE 18 (=1/0)	0.00021662*** (0.00006022)	0.00036597 (0.00024609)	0.00003591 (0.00002901)	0.00014268 (0.00012173)
Trend: pre-BD	0.00001270** (0.00000519)	0.00003614 (0.00002285)	0.00000351 (0.00000244)	0.00000515 (0.00001082)
Trend: post-BD	-0.00000422 (0.00000862)	0.00001410 (0.00003718)	0.00000066 (0.00000422)	0.00002317 (0.00001887)
Birthday month effect	-0.00011458 (0.00008470)	-0.00057499* (0.00030426)	-0.00005765* (0.00003387)	0.00009561 (0.00017459)
Mean of Y	0.00127	0.03369	0.00281	0.00956
Bandwidth	+/-36 months			
Year-of-birth FEs	Yes	Yes	Yes	Yes
N	170,910	48,519	162,552	45,915
SEs	Robust	Robust	Robust	Robust

Notes: This table presents heterogeneity results by ethnicity. Māori represents youth identified as Māori in the APC constants dataset and non-Māori if ethnicity information is provided but not Māori stated. AGE 18 (=1/0) is the key coefficient of interest. Standard errors are robust and shown in parentheses. ***p<0.01, **p<0.05, *p<0.1. Estimates are based on New Zealand administrative data from the Integrated Data Infrastructure (IDI), and are the author's own calculations.

c. Age threshold 20

Y: share of drink-driving offences by youth				
Sample	Males 20		Females 20	
Age threshold				
Parents drink-driving conviction:	no	with	no	with
	(1)	(2)	(3)	(4)
Māori				
AGE 20 (=1/0)	-0.00076604*** (0.00019454)	-0.00150858*** (0.00031575)	-0.00029901*** (0.00011402)	-0.00054684** (0.00021530)
Trend: pre-BD	0.00001392 (0.00002168)	0.00005019 (0.00003503)	0.00000096 (0.00001349)	0.00002926 (0.00002529)
Trend: post-BD	-0.00000699 (0.00002819)	0.00000468 (0.00004671)	0.00001600 (0.00001741)	-0.00003861 (0.00003094)
Birthday month effect	0.00039206 (0.00024552)	0.00008979 (0.00038395)	0.00007523 (0.00014418)	0.00008261 (0.00026254)
Mean of Y	0.03262	0.06064	0.0118	0.02585
non-Māori				
AGE 20 (=1/0)	-0.00041476*** (0.00006903)	-0.00091562*** (0.00025914)	-0.00010210*** (0.00003246)	-0.00035765** (0.00015425)
Trend: pre-BD	0.00001403* (0.00000761)	-0.00003592 (0.00003075)	0.00000510 (0.00000362)	0.00001699 (0.00001689)
Trend: post-BD	-0.00001734* (0.00000994)	0.00006728* (0.00003917)	-0.00000398 (0.00000472)	-0.00000220 (0.00002228)
Birthday month effect	0.00029730*** (0.00009286)	0.00108669*** (0.00033707)	0.00005674 (0.00004132)	-0.00008082 (0.00015663)
Mean of Y	0.01698	0.04114	0.00365	0.01351
Bandwidth	+/-36 months			
Year-of-birth FEs	Yes	Yes	Yes	Yes
N	170,910	48,519	162,552	45,915
SEs	Robust	Robust	Robust	Robust

Notes: This table presents heterogeneity results by ethnicity. Māori represents youth identified as Māori in the APC constants dataset and non-Māori if ethnicity information is provided but not Māori stated. AGE 20 (=1/0) is the key coefficient of interest. Standard errors are robust and shown in parentheses. ***p<0.01, **p<0.05, *p<0.1. Estimates are based on New Zealand administrative data from the Integrated Data Infrastructure (IDI), and are the author's own calculations.

