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## Parents' Earnings Response to Youth Suicide: Evidence from New Zealand Administrative Records --Manuscript Draft--

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<b>Abstract:</b>	<p>The loss of a child is one of the most devastating shocks a parent can experience. We provide the first estimates of the direct effect of youth suicide on parental labour earnings. We use mortality data in the New Zealand Integrated Data Infrastructure to identify youth who died from self-harm, and birth records to identify affected parents and their wage and salary information. We graph the parental earnings profiles before and after the suicide event and construct counterfactual earnings profiles for the affected parents using a comparison group of parents hit by the same shock in the future. Our results show that labour earnings for affected households drop by approximately 6.5% compared to their counterfactual earnings following the child loss and that the earnings drop persists for at least two years following the suicide.</p>
<b>Suggested Reviewers:</b>	<p>Torben Heien Nielsen, PhD Associate Professor, University of Copenhagen thn@econ.ku.dk We adopt the econometric approach from Fadlon &amp; Nielsen (AER - 2019) and also study family reactions to health shocks.</p> <p>Petter Lundborg, PhD Professor, Lund University petter.lundborg@nek.lu.se Petter Lundborg is a co-author on "The economics of grief" (The Economic Journal 2016) which is the closest reference in terms of topic.</p> <p>Andrea Menclova, PhD Associate Professor, University of Canterbury andrea.menclova@canterbury.ac.nz High familiarity with NZ administrative health data and several publications in Health Economics: e.g. <a href="http://dx.doi.org/10.1016/j.jhealeco.2020.102317">http://dx.doi.org/10.1016/j.jhealeco.2020.102317</a></p>

# Parents' Earnings Response to Youth Suicide: Evidence from New Zealand Administrative Records

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## Abstract:

The loss of a child is one of the most devastating shocks a parent can experience. We provide the first estimates of the direct effect of youth suicide on parental labour earnings. We use mortality data in the New Zealand Integrated Data Infrastructure to identify youth who died from self-harm, and birth records to identify affected parents and their wage and salary information. We graph the parental earnings profiles before and after the suicide event and construct counterfactual earnings profiles for the affected parents using a comparison group of parents hit by the same shock in the future. Our results show that labour earnings for affected households drop by approximately 6.5% compared to their counterfactual earnings following the child loss and that the earnings drop persists for at least two years following the suicide.

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Disclaimer: *These results are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI) which is carefully managed by Stats NZ. For more information about the IDI please visit <https://www.stats.govt.nz/integrated-data/>. The results are based in part on tax data supplied by Inland Revenue to Stats NZ under the Tax Administration Act 1994 for statistical purposes. Any discussion of data limitations or weaknesses is in the context of using the IDI for statistical purposes, and is not related to the data's ability to support Inland Revenue's core operational requirements.*

Data availability: *Data subject to third party restrictions: The data that support the findings of this study are available from Statistics New Zealand. Restrictions apply to the availability of these data, which were used under license for this study. Data are available from a secured repository, located onsite in New Zealand, with the permission of Statistics New Zealand.*

Ethical Statement: *Our study uses secondary data via Stats NZ's IDI. Therefore, we did not conduct primary research involving individuals. Importantly, Māori data sovereignty is a key consideration in the use of secondary data. This is an integral part of Stats NZ datalab project application process, with their Ngā Tikanga Paihere framework*

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## Introduction

Suicide remains a leading cause of death among people aged 15-29 worldwide, comprising around 8% of all deaths in this group (United Nations, 2021). While suicide and youth suicide rates have steadily declined across all OECD countries since the mid-1980s, no OECD country is on-track to meet the suicide reduction rate target set by the United Nation's 2030 Agenda for Sustainable Development (Ishimo et al., 2021). Hence, suicide remains a significant global health issue.

While the existing literature has documented how various factors influence the likelihood of suicide<sup>1</sup>, less is known about the impact of suicide for the surviving family members.

When parents lose a child, they experience an abundance of negative emotions such as extreme sadness, shock, and anger (Andriessen et al., 2019). These factors may have severe economic consequences in terms of, for example, reduced labour earnings, as shown in van den Berg et al. (2016)<sup>2</sup> who study parents in the aftermath of child-loss from non-intentional accidents.

In this paper we extend the economic consequences of grief literature by providing *the first* evidence on how parents' labour earnings respond to youth suicide. The empirical challenge is to establish the counterfactual observation: *what parents experiencing youth suicide would have earned if their child had not committed suicide*. To identify the causal impact, we compare affected households with households exposed to youth suicide in the future. This follows Fadlon and Nielsen (2019, 2021), but for suicide rather than health shocks. Our analysis uses population-wide administrative data from New Zealand (NZ), a country plagued by some of the highest youth suicide rates amongst developed countries (MSD, 2016; OECD, 2017; UNICEF, 2020). We show that youth suicide leads to an immediate decrease in household labour earnings of about 6.5% with no sign of recovery within 24 months post-suicide. Total income, including welfare benefits and public insurance payments, drops about 4.5% with no sign of recovery. Hence, public transfers help households recover some, but not all, of their lost labour earnings. Finally, we show that responses are strongest for high school graduates, while there is no significant response for university graduates (who are likely to have contractual

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<sup>1</sup> Lang (2013) shows mandated health benefits lower suicide rates. Kuroki (2014) finds higher male-to-female sex ratios are correlated with higher male suicide rates. Breuer (2015) shows unemployment increases lead to higher suicide rates. Blæhr and Søggaard (2021) find no effect of psychotherapy on suicide attempt.

<sup>2</sup> The robustness analyses in that paper include results for intentional accidents, but this combines suicide and homicide.

bereavement periods) and a marginally significant response for those with no qualifications (who have limited labour earnings initially).

## Data

We use population-wide linked administrative data from NZ's Integrated Data Infrastructure (IDI) for 1999-2019.

*Identifying suicides.* The NZ police are legally required to investigate the cause of sudden deaths. The police reports the details of their investigation to the coroner, who conducts a public inquiry into the circumstances of the death. A death is confirmed as a suicide if the coroner concludes the deceased intended to take their own life. The Ministry of Health's individual-level mortality registrations and diagnosis data are made available in the IDI.

*Mortality Records.* We identify all youth (10-25 years<sup>3</sup>) deaths from 2001-2018 where the underlying cause of death is intentional self-harm. Intentional self-harm is the first-equal most prevalent cause of death for this age group, contributing about 28% of deaths over this period.<sup>4</sup> We observe 2,250 youth suicides.

*Birth Records.* We link suicide victims to their parents via birth registers (83% can be linked to at least one parent<sup>5</sup>). We keep working-aged (30-60 years) parents and exclude observations where parents were deceased at the time of youth suicide. Our main sample includes 1,299 youth who can be linked to both parents, which we consider a household. Appendix Table A.1 shows sample construction numbers.

*Monthly Earnings.* We link each parent to their monthly earnings records from the NZ tax authority's registers. These IDI records are available from 1999, allowing us to create an 18-month pre-event earnings profile for every parent in our sample.

For each household, we create an earnings profile spanning from 18 months before to 12 months after the suicide. Appendix Table A.2 shows household-level descriptive statistics. Figure A.1 shows the labour earnings distribution for the full population aged 30-60 and overlays selected percentiles from the earnings distribution of the suicide household sample. Measured in the

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<sup>3</sup> Ages 10-25 account for the average age parents think children will move out of home (RaboDirect, 2015). Results are similar when restricting to ages 10-18. We observe no suicide before age 10.

<sup>4</sup> Another 28% of deaths are attributed to transport accidents.

<sup>5</sup> 17% of youth suicide victims are not born in NZ and therefore are not registered in the birth register.

calendar year two years prior to child loss, approximately 68% of parents have earnings below the population median while 19% of parents have no labour income.

### Quasi-Experimental Research Design

Our objective is to identify the causal effect of youth suicide on parents' labour earnings. The main challenge is to estimate how the earnings profile for affected households would have looked in the absence of youth suicide. Using the approach by Fadlon and Nielsen (2019, 2021) but for suicide events, we construct counterfactual earnings profiles for households experiencing youth suicide at time  $t$  (treatment group) by using the earnings trajectories of parents who experience youth suicide  $\Delta$  months later at time  $t + \Delta$  (comparison group). In our primary specification we use  $\Delta = 13$ , allowing us to estimate the earnings impact for the first year after suicide.

Our suicide data span 216 months from 2001 to 2018. We match those treated in each month with their ' $\Delta$ -months later' comparison group. For  $\Delta = 13$ , this gives us 203 matched pairs. Within each matched pair, the time of youth suicide for the treatment group ( $e=0$ ), will serve as a placebo treatment time for the comparison group. By construction, for our primary specification,  $e = 13$  indicates the actual 'treatment' time for the comparison group. Therefore, for the event timeline spanning -18 to 12 months, the comparison group is constructed using 31 pre-suicide months from households experiencing suicide in month 13. We proceed by estimating the following dynamic difference-in-differences model:

$$Y_{i,t} = \alpha + \beta \cdot treat_i + \sum_{\substack{e \neq -6, \\ e = -18}}^{12} \varphi_e \cdot M_e + \sum_{\substack{e \neq -6, \\ e = -18}}^{12} \delta_e \cdot M_e \cdot treat_i + \gamma \cdot X_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where  $Y_{i,t}$  denotes labour earnings for household  $i$  at time  $t$ ,  $treat_i$  is an indicator equal to one if the household belongs to the treatment group,  $M_e$  are event time indicators (placebo event time indicators for the comparison group), and  $X_{i,t}$  denotes calendar month and year fixed effects. The parameters of interest are the  $\delta_e$ 's that capture the difference in mean earnings between treatment and comparison households  $e$  months after (or before) youth suicide, relative to the difference in mean earnings between these two groups six months prior to suicide.

$\delta_e$  identifies the causal effect of youth suicide on household earnings under the assumption that in the absence of the youth suicide, the evolution of labour earnings among the affected households would, on average, be the same as the evolution of labour earnings among the not-yet-affected households. While this assumption is untestable, we provide evidence favouring it

by showing the two groups follow the same earnings trend in the 18 months before suicide, i.e., estimates of  $\delta_e$  are close to 0 for  $e < 0$ .

We estimate Equation (1) in levels rather than logs, because individuals with zero earnings constitute a large share of our sample. For ease of interpretation, we report estimates of  $\delta_e$  in percent of the counterfactual earnings level of the treatment group, calculated as:

$$P_e = \frac{\delta_e}{E[\hat{Y}_{i,t}|e, treat_i = 1]} \quad (2)$$

Where  $\hat{Y}_{i,t} = \hat{\alpha} + \hat{\beta} + \sum_{e \neq -6, e=-18}^{12} \hat{\varphi}_e \cdot M_e + \hat{\gamma} \cdot X_{i,t}$ , is the predicted counterfactual earnings for household  $i$  in the treatment group at event time  $e$ .

Finally, to capture average treatment effects across all post-suicide months and for increased precision, we denote  $e > 0$  months as ‘after’ and estimate a two-period difference-in-differences model:

$$Y_{i,t} = \alpha + \beta \cdot treat_i + \varphi \cdot after_{i,t} + \delta_1 \cdot after_{i,t} \cdot treat_i + \gamma \cdot X_{i,t} + \varepsilon_{i,t} \quad (3)$$

where  $\delta_1$  is the parameter of interest. We use Equation (2) with  $\delta_1$  in place of  $\delta_e$  to calculate responses in percent of counterfactual earnings.

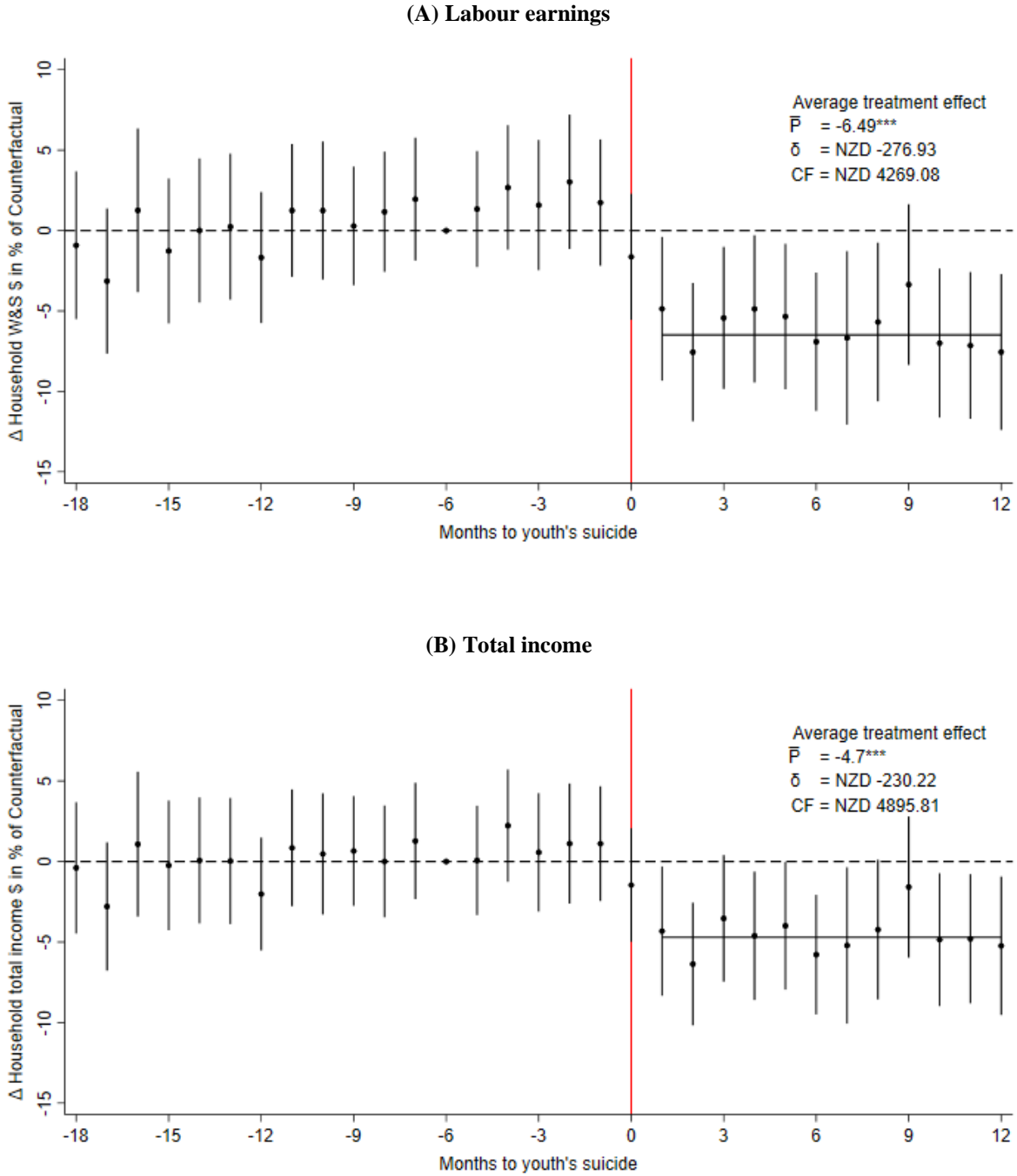
## Results

Figure 1 shows estimates of the dynamic effect of youth suicide on household earnings (Panel A) and total income (Panel B). The  $x$ -axis denotes months since youth suicide. The household earnings response is immediate, significant, and long-lasting: after 2 months the suicide-affected households earn 7.5% below their counterfactual earnings. This response persists for the full 1-year observation window. In the 12 months following youth suicide, the average monthly earnings loss is NZD276.93 or 6.49% of the counterfactual earnings level NZD4,269.08.<sup>6</sup> Notably, the estimates of  $P_e$  in the 18-month window prior to youth suicide are all close to 0 and insignificant, i.e., the treatment and comparison groups follow the same earnings trajectory, supporting the common trends assumption. Appendix Figure A.2 shows similar results for 6- and 24-month windows: the earnings drop is of similar magnitude (5-6% below counterfactual earnings). Notably, even in the 2-year post-suicide observation window, the earnings response shows no sign of recovery.

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<sup>6</sup> Using the household sample but treating parents as individual observations allows us to study labour earnings responses along the extensive and intensive margins. On the extensive margin the employment drop is approximately 5%. On the intensive margin the labour earnings drop is approximately 3%.

**Figure 1: Household earnings response to youth suicide**



Notes: These figures show household labour earnings (Panel A) and total income (Panel B) responses to youth suicide using specification (1) and (2). Both measures are winsorized at the 99<sup>th</sup> percentile. The x-axis denotes months relative to youth suicide, normalized to period 0 for the treatment group (while the comparison group is treated at month 13). We normalize the comparison group’s outcome to the earnings level of the treatment group six months prior to suicide. The vertical bars indicate the 95% confidence intervals. The black circles are the point estimates. The horizontal solid black line across months 1-12 is the average effect ( $\delta_1$ ) from Equation (3) measured in percent of the counterfactual earnings of the treatment group calculated according to Equation (2). The average effect in NZD and the counterfactual NZD earnings/total income are stated on the graph. Stars denote significance as: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Standard errors are clustered at the child level. Both graphs include our full household sample  $n = 1,299$ .

In Panel B we estimate the effect of youth suicide on households' total income to investigate if parents can recover their lost labour earnings via alternative income sources. Total income consists of labour earnings; withholding tax deducted payments; public insurance Accident Compensation Corporation payments; various company-based earnings; and welfare benefits, parental leave, and student allowance payments. Results show total income drops, albeit slightly less than the drop in earnings: the average monthly earnings loss is 6.49% (Panel A) versus 4.70% for total income (Panel B). Moreover, while parents can offset some of their earnings loss with income from other sources, they still lose income due to their earnings response to youth suicide.

Repeating the analysis using the mother's share of total household income as the dependent variable shows there is no intra-household earnings shifting, i.e., parents respond in equal measure to youth suicide. Appendix Figure A.3 shows the earnings drop for mothers and fathers analysed separately is 8.39% and 5.42%, respectively.

### **Heterogeneity**

Next, we examine if the earnings response to youth suicide differs by households' socio-economic-status, proxied by highest educational attainment within the household. We estimate Equation (3) for three education groups separately.

Table 1 shows earnings responses are strongest among high school graduates, with smaller and marginally significant drops for households with no recorded educational qualification and insignificant drops for households with university graduates. A possible explanation behind this pattern is the strength of the labour market attachment prior to youth suicide. Individuals with no qualifications have limited labour market attachment, leaving little room for earnings to respond. University graduates have stronger labour market attachment and likely have contractual allowances for extended periods of bereavement and sick leave curbing their response.<sup>7</sup> High school graduates fall between these two groups, with employment rates similar to university graduates but with significantly lower earnings.<sup>8</sup>

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<sup>7</sup> People with university qualifications are less likely to work in industries with high worker turnover rates than are people with high school or no qualifications (Stats NZ, n.d.a; n.d.b), and since workers in low-turnover jobs are more likely to meet the time-based eligibility criteria for employment leave, including bereavement leave (Employment NZ, n.d.), this suggests university graduates are more likely able to alleviate the earnings losses from youth suicide compared to other groups.

<sup>8</sup> Measured two years prior to suicide, individuals with no qualifications and high school graduates earn approximately 30% and 65% of university graduates, respectively.

**Table 1: Labour earnings response to youth suicide by households' socio-economic-status**

Education	Labour earnings response ( $\delta_1$ NZD)	Labour earnings response in % of counterfactual ( $P_1$ )	Households
<i>No qualification</i>	-150.61*	-5.69*	516
<i>High school</i>	-368.00***	-7.62***	612
<i>University</i>	-305.72	-4.39	171

Notes: This table reports difference-in-differences estimates for households' labour earnings response to youth suicide separately for each education group using Equations (3) and (2). Column 2 reports  $\delta_1$  from Equation (3) and Column 3 reports results from Equation (3) converted into percent of counterfactual earnings using Equation (2). Counts of households in each educational attainment category are given in Column 4. We define household educational attainment by the highest completed degree of either parent. Stars denote significance as: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Standard errors are clustered at the child level.

## Conclusion

This is the first paper to document household earnings responses to youth suicide. Results showed labour earnings for affected households dropped by 6.49% after suicide compared to their counterfactual earnings. The earnings drop persisted for at least two years post-suicide and is strongest for socio-economic groups with weak labour market attachment. These results may be used to improve the design of policies to help bereaved parents and to reduce the economic cost of bereavement.

## APPENDIX

**Table A.1: Sample construction**

Sample restriction		Observations
Youth deaths 2001-2018		7,878
1	Total youth suicide	2,250
2	Mother identified via birth register and not deceased	1,683
3	Mothers aged 30-60 at time of child death	1,656
4	Father identified via birth register and not deceased	1,452
5	Fathers aged 30-60 at time of child death	1,347
6	Total households = youth suicides with both parents linked within age range	1,299

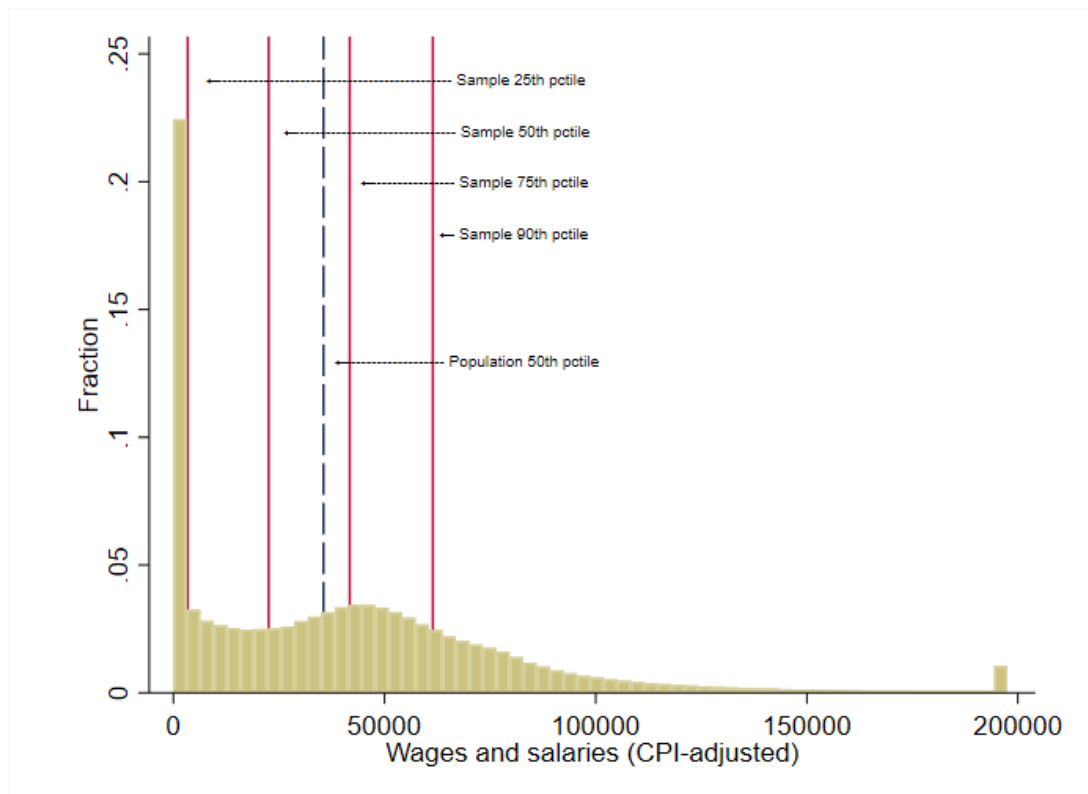
Note: This table shows the sample construction numbers. We use mortality datasets to identify youth deaths and youth suicides. We use birth registers to link youth suicide victims with their parents. This requires the youth to be NZ-born, with at least one parent identified on their birth certificate. This data limitation is the reason our mother, father, and household samples are notably smaller than the total number of youth suicides. We require each parent to be aged 30-60 at the time of youth suicide. We define a household as a youth suicide victim linked to both parents who are of working age at the time of child death.

**Table A.2: Household characteristics**

Household characteristics	Both-parent households
Counts	1,299
% daughter suicide	29.10
% child European	48.50
% child Māori	42.96
% child Pacific	6.70
% child Asian	1.39
Average age of child at death	19.71
% Both parents have no qualifications	39.72
% At least one parent has high school qualifications	47.11
% At least one parent has university qualifications	13.16
Average monthly household W&S 2-years prior to youth suicide	3,868
Average monthly household total earnings 2-years prior to youth suicide	4,540

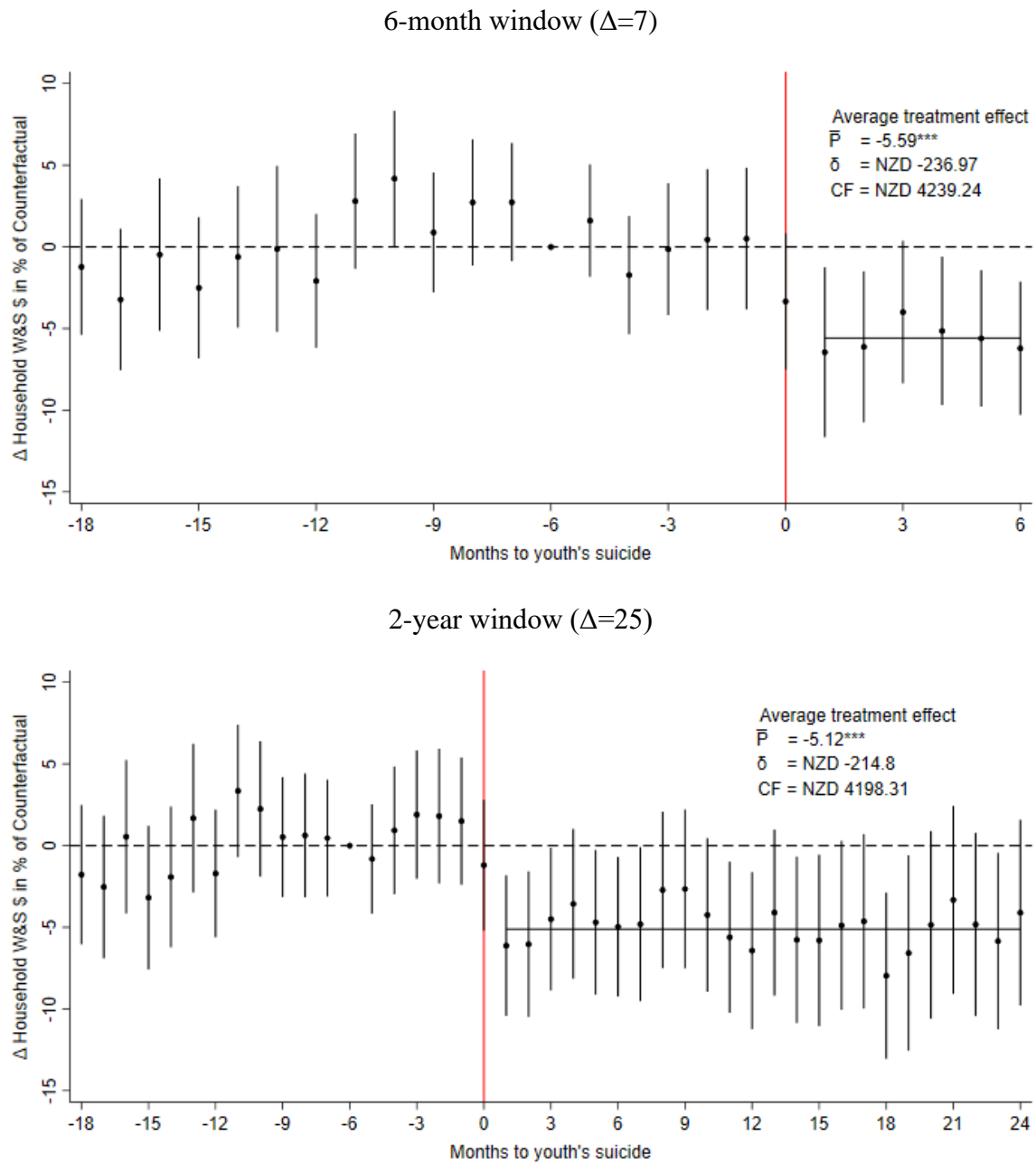
Note: This table describes our main sample of households. We define household educational attainment by the highest completed degree of either parent, imputed from Census 2013. Average wages and salaries and total earnings variables are measured in NZD, winsorized at the 99<sup>th</sup> percentile.

**Figure A.1: Full population (age 30-60) labour earnings distribution versus selected percentiles from the earnings distribution of households experiencing suicide**



Note: This figure presents the annual earnings distribution of the full population of 30-60-year-olds. We overlay selected percentiles from the annual earnings distribution of households experiencing suicide to benchmark our sample against the population. For the total population, we obtain the (CPI-adjusted) annual earnings distribution for all 30-60-year-olds pooled across 1999-2016. For the suicide sample, we calculate each households' per-parent (CPI-adjusted) annual earnings in the calendar year two years prior to youth suicide (ranging 1999-2016 as suicide data runs 2001-2018). After appending all years, we calculate the 25<sup>th</sup>, 50<sup>th</sup>, 75<sup>th</sup>, and 90<sup>th</sup> earnings percentiles from the suicide household sample and overlay these markers on the total population earnings distribution.

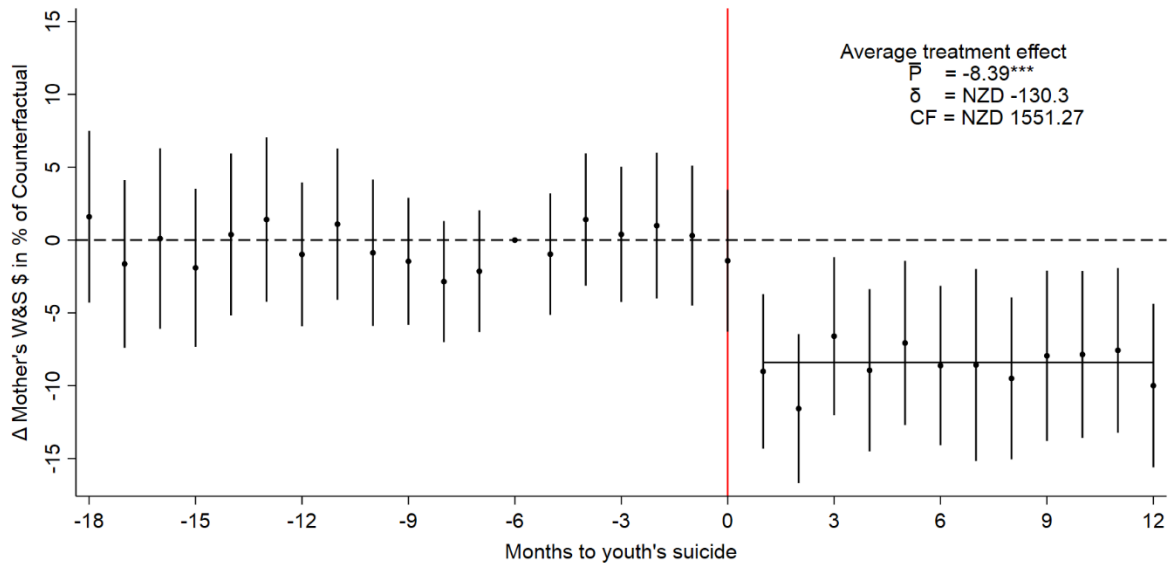
**Figure A.2: Household labour earnings response to child suicide across different estimation windows**



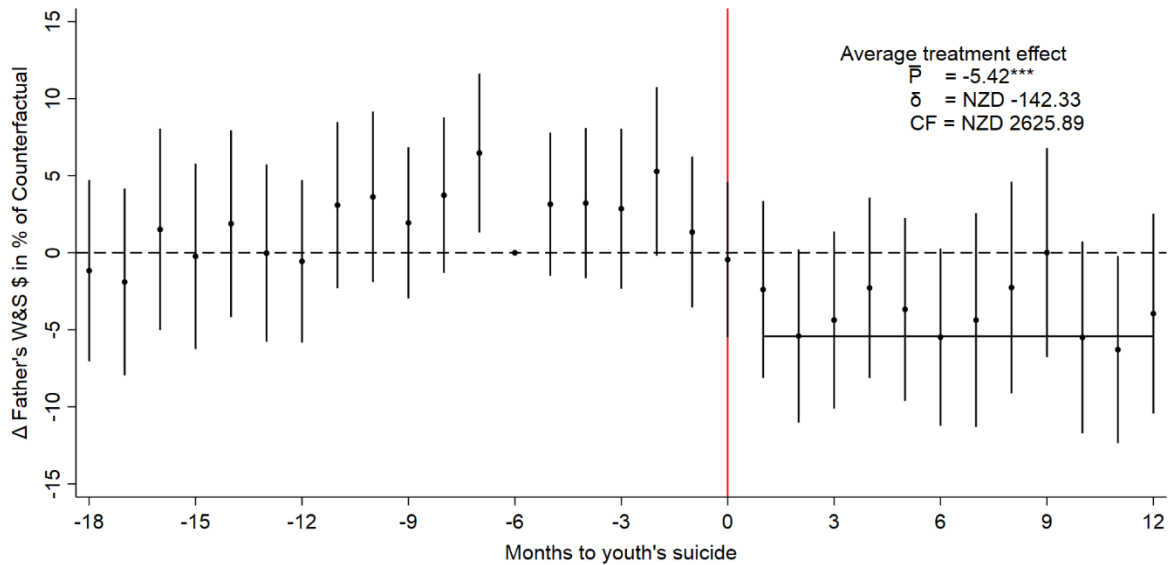
Note: These figures show household labour earnings responses to child suicide using Equations (1) and (2), varying the ‘ $\Delta$ -months later’ comparison group time definition across 7 and 25 months. Labour earnings are winsorized at the 99<sup>th</sup> percentile. The x-axis denotes months relative to youth suicide, normalized to period 0 for the treatment group (while the comparison group is treated at month  $\Delta$ ). We normalize the comparison group’s outcome to the earnings level of the treatment group six months prior to suicide. The vertical bars indicate the 95% confidence intervals. The black circles are the point estimates. The horizontal solid black line across months 1-12 is the average treatment effect estimated by Equation (3) measured in percent of the counterfactual earnings of the treatment group calculated according to Equation (2). The average effect in NZD and the counterfactual NZD earnings are stated on the graph. Standard errors are clustered at the child level. All graphs include our full household sample  $n=1,299$

**Figure A.3: Mothers and fathers' labour earnings responses to youth suicide**

**(A) Mothers**



**(B) Fathers**



Note: These figures show mothers' (Panel A,  $n=1,656$ ) and fathers' (Panel B,  $n=1,347$ ) labour earnings responses to child suicide using Equations (1) and (2). Labour earnings are winsorized at the 99<sup>th</sup> percentile. The x-axis denotes months relative to youth suicide, normalized to period 0 for the treatment group (while the comparison group is treated at month 13). We normalize the comparison group's outcome to the earnings level of the treatment group six months prior to suicide. The vertical bars indicate the 95% confidence intervals. The black circles are the point estimates. The horizontal solid black line across months 1-12 is the average treatment effect estimated by Equation (3) measured in percent of the counterfactual earnings of the treatment group calculated according to Equation (2). The average effect in NZD and the counterfactual NZD earnings are stated on the graph. Stars denote significance as: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Standard errors are clustered at the parent level.



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