

# MODELLING LONG RUN COSTS OF CHILD ABUSE

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# Background

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- 2006 to 2009: ~55,000 substantiated child abuse or neglect cases in Australia annually (AIHW, 2010).
- One third of these cases are for physical or sexual abuse, the remainder relate to emotional abuse and neglect.
- 2010 CHERE participated in an economic evaluation of Brighter Futures, an intervention program for vulnerable families with children at risk of abuse and/or neglect.
- In addition to estimating the cost effectiveness of the program in the short run, we sought to undertake a cost-benefit analysis, including the long term benefits (costs avoided) of preventing child abuse.
- We reviewed the literature and found relevant, quantifiable evidence on the impact of early intervention programs on education, crime and justice and labour force outcomes.

# Background

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- We found limited existing Australian research on the long run health impacts and costs of child abuse, derived from international evidence:
  - ▣ Attributed fractions of long run disease specific costs of sexual abuse applied to all child abuse (Taylor et al, 2008)
  - ▣ Ratio of long term to short term costs in US applied to short run cost estimates (including health) in Australia (Kids First Foundation, 2003)
- The need for a reliable estimate of long run impact of child abuse on health care costs in Australia led to our paper ...
- Ours is the first Australian paper to directly estimate the long run impact of child abuse on health care costs and other outcomes using an econometric approach and unit record data

# Our paper

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- Primary Aims:

To estimate the impact of **child abuse** on **adult health and health care costs** in Australia.

- Based on **template paper**: Tang, et al (2006) *The influence of child abuse on the pattern of expenditures in Women's adult health service utilization in Ontario, Canada*, Social Science and Medicine 63, pp. 1711-1719.

- Additional Aims:

To estimate the impact of **child abuse** on **self harm (attempted suicide, drug and alcohol problems)**.

- Data Source: **National Survey of Mental Health and Wellbeing (SMHW 2007)**, expanded confidentialised unit record file (CURF), remote accessed via the ABS.

# Data and Methods

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- National sample of 8841 persons aged from 16 to 85.
- Includes questions on physical and sexual abuse, including age first abused.
- Data are weighted using p-weights and replicate weights to enable population estimates and correct standard errors to be calculated (accounting for the probability of selection and the survey sampling design).
- Following Tang, we estimate:
  - the impact of child abuse on adult physical and mental health
  - the impact of child abuse on adult health care costs
  - the degree to which the impact of child abuse on adult health care costs occurs via the number of physical and mental health conditions.

# Data and Methods

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- Models 1 and 2: Negative binomial regressions of the number of **physical** and number of **mental** health conditions on whether **abused as a child** (physical only, sexual only or combined physical and sexual abuse) controlling for socioeconomic and demographic differences.
- Model 3: Regression of the **square root of total health care costs** in last 12 months on the same abuse and socioeconomic and demographic variables used in models 1 and 2.
- Model 4: Repeat of model 3, adding **number of physical** and **number of mental health conditions** as additional **explanatory variables**.
- Comparing models 3 and 4 demonstrates the degree to which the impact of abuse on health care costs occurs via health conditions.

# Differences between our data and methods and Tang's

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- Our data is **national** and includes both **men and women**. Consequently, we include **sex and geography** as covariates.
- We include **social support** as an explanatory variable.
- We use a **larger range of health services** to estimate costs (GPs, psychologists, psychiatrists, specialist Drs/surgeons, other health professionals, alternative therapists, hospital admissions and pharmaceuticals).
- We use **negative binomial regression** to estimate the number of **physical and mental health conditions**, Tang et al use OLS.
- Tang et al use a logarithmic transformation of **total costs** in their regressions, whereas we have used a **square root transformation** (chosen based on specification test results).
- We test for correlation between the error terms

# Descriptive statistics (p-weighted)

Variable	Mean	Median	Range
Total health care costs in last 12 months	\$452.77	\$152.04	\$0 - 31,745
Number of physical health conditions	1.7	1	0 - 14
Number of mental health conditions	0.4	0	0 - 11
Physical abuse only	5.9%	0	0 - 1
Sexual abuse only	7.2%	0	0 - 1
Combined abuse	2.4%	0	0 - 1
Age	44.3	43	16 - 85
Social marital status = married	57.0%	1	0 - 1
Sex = female	50.3%	1	0 - 1
Socio Economic Status (SES)	9.2	9	3 - 15
Income missing	15.4%	0	0 - 1
Support (any)	98.8%	1	0 - 1
Remoteness	1.5	1	1 - 3

# Descriptive statistics

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Mean number of physical and mental health conditions and health care cost per person in last 12 months, by type of abuse experienced

Type of child abuse	Number of physical health conditions	Number of mental health conditions	Annual health care costs
Not abused	1.5	0.3	367.89
Physical only	2.1	0.6	517.21
Sexual only	2.4	0.8	810.66
Combined	2.8	1.8	2224.38

# Results

## Negative binomial regressions of number of physical and mental health conditions

	Model 1: physical health conditions		Model 2: mental health conditions	
Variable	I.R.R.	p value	I.R.R.	p value
<b>Physical abuse only</b>	<b>1.42</b>	<b>0.000</b>	<b>1.72</b>	<b>0.000</b>
<b>Sexual abuse only</b>	<b>1.51</b>	<b>0.000</b>	<b>2.42</b>	<b>0.000</b>
<b>Combined abuse</b>	<b>1.89</b>	<b>0.000</b>	<b>4.50</b>	<b>0.000</b>
Age 30 to 44	1.60	0.000	1.19	0.055
Age 45 to 59	2.26	0.000	0.99	0.941
Age 60 to 74	3.10	0.000	0.47	0.000
Age 75 to 85	3.40	0.000	0.19	0.000
Married or equiv.	0.98	0.559	0.55	0.000
Female	1.21	0.000	1.12	0.149
SES index (3 to 15)	0.97	0.000	0.93	0.000
Income missing	0.94	0.279	1.05	0.675
Has social support	0.64	0.005	0.37	0.000
Remoteness (1 to 3)	0.99	0.795	0.90	0.068

# OLS regressions of the square root of total health care costs in the last 12 months

	Model 3: w/out # health conditions		Model 4: with # health conditions	
Variable	$\beta$	<i>p</i> value	$\beta$	<i>p</i> value
# physical conditions			<b>1.60</b>	<b>0.000</b>
# mental conditions			<b>4.28</b>	<b>0.000</b>
Physical abuse only	<b>1.77</b>	<b>0.017</b>	<b>-0.17</b>	<b>0.795</b>
Sexual abuse only	<b>5.52</b>	<b>0.000</b>	<b>2.30</b>	<b>0.023</b>
Combined abuse	<b>16.68</b>	<b>0.000</b>	<b>9.07</b>	<b>0.001</b>
Age 30 to 44	2.98	0.000	1.80	0.002
Age 45 to 59	4.41	0.000	2.71	0.000
Age 60 to 74	6.41	0.000	4.53	0.000
Age 75 to 85	9.12	0.000	7.45	0.000
Married or equiv.	-0.67	0.135	0.39	0.332
Female	2.88	0.000	2.40	0.000
SES index (3 to 15)	-0.39	0.000	-0.20	0.006
Income missing	-0.76	0.238	-0.65	0.267
Has social support	-8.69	0.004	-3.91	0.199
Remoteness (1 to 3)	-1.51	0.000	-1.35	0.000
Constant	24.59	0.000	15.00	0.000

# Discussion

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- Child abuse is significantly associated with long run increases in the number of physical and mental health conditions.
- The size of effect differs by type of abuse
- Comparing models 3 and 4: to what degree is the impact of abuse on health care costs mediated by the number of health conditions?
  - Physical abuse becomes highly insignificant when health conditions are added to the total cost equation, indicating the impact of physical abuse on health costs is completely mediated by physical and mental health conditions.
  - Sexual abuse and combined abuse each remain significant (suggesting a direct effect on health costs) but the size of the coefficients is reduced, indicating that approximately half of the effect of sexual abuse and combined abuse on health care costs occurs through physical and mental health conditions.

# Discussion: additional statistical tests

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- Dependent variables in models 1 and 2 (physical and mental health conditions) are explanatory variables in model 4 (health costs)
  - This relationship is recursive, meaning that **the direction of causation is one way** (health care costs do not typically cause health conditions).
  - But the **residuals may be correlated** due to capturing the same unobserved effects.
  - To test this possibility we used Roodman's (2009) Conditional Mixed Processes (CMP) command, which allows simultaneous multi-equation estimation of recursive models which have a uni-directional causal relationship. **The correlations between the residuals were statistically insignificant.**

# Discussion: testing interactions

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- To test whether the current health impacts of child abuse depend on **years since childhood**, models 1 to 4 were rerun with abuse interacted with current age.
  - ▣ There was little evidence that the impact of abuse on health care costs reduces over the victim's lifetime.
- To test whether the current health impacts of child abuse differ **for male compared to female victims**, models 1 to 4 were rerun with abuse interacted with sex.
  - ▣ Female victims of combined abuse experienced an additional 1.5 times the number of physical health conditions ( $p=0.043$ )
  - ▣ There were no significant differences between male and female victims with respect to the number of mental health conditions.
  - ▣ Male victims of sexual abuse had higher health care costs after controlling for the number of conditions (model 4)

# Extended econometric analyses:

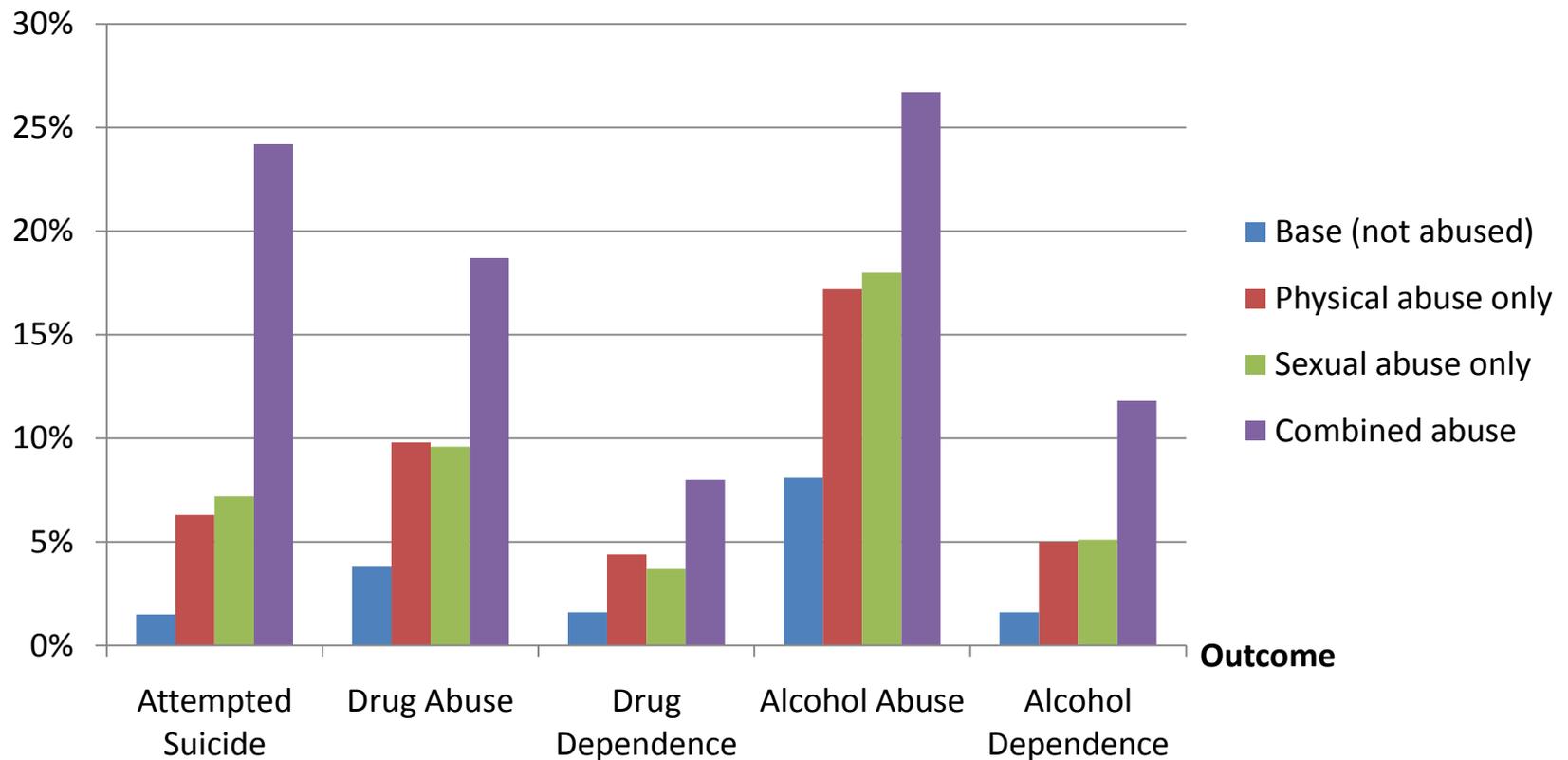
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- Extension of analyses to the impact of child abuse on self harm; estimated using logit (or probit) models, with the same covariates as models 1 and 2 and dependent variables as follows:
  - Self harm:
    - attempted suicide
    - drug abuse/harmful use
    - drug dependence
    - alcohol abuse/harmful use
    - alcohol dependence

# Results – Self Harm

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## Probability of outcome



The base case, based on median characteristics, is a 43 year old (age cohort 30 to 44) married female, living in a major city, has a median socioeconomic status and social support from family and/or friends.

# Overall conclusions

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- This research has important consequences for evaluating expected benefits of interventions to prevent child abuse in Australia
- In addition to immediate consequences to the victim, child abuse has **long run** consequences on **health** and **wellbeing** and **external effects** including:
  - ▣ Cost to health system (direct and indirect)
  - ▣ Social costs (through the impact of suicide and substance misuse)
- The magnitude of the impacts of child abuse vary depending on the type of abuse
  - ▣ **Combined abuse** has the largest effect on all indicators

# Further research

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- The square root transformation only dealt with the skewness of health expenditure distribution but the existence of zero mass has not been considered.
- Two-Part Model: split health expenditures into two parts
  1. Pr(any use or expenditures): full sample; use logit or probit regression
  2. Level of use or expenditures: subsample with  $y > 0$ ; use transformation such as square root,  $\ln(y)$  or GLM with gamma distribution