

# Fire Research Report

## **Risk factors and offending behaviours among children and adolescents who deliberately light fires**

**Auckland UniServices Limited**

**December 2013**

The study draws upon longitudinal data on child firesetters who were referred to the New Zealand Fire Service Fire Awareness and Intervention Programme (FAIP) and investigates the relationship between conduct problems, firesetting behaviour and subsequent offending, to gain a better understanding of the risk factors for firesetting and offending behaviours amongst a firesetting population. Additionally, the current study aims to investigate whether there are distinct clusters of firesetters that have similar characteristics, risk factors and comorbid pathology relating to their behaviour/s, and to what extent these clusters in the sample resemble those present in the existing body of literature.

Overall, the sample had a number of serious environmental, psychosocial/emotional and behavioural difficulties. Many differences found between age groups (children and adolescents) were expected given normative development. When compared to child offenders, adolescents committed more severe offences, were more likely to offend in groups, and overall displayed more antisocial traits than child firesetters. Cluster analysis derived a five cluster solution which comprised five distinct clusters that differed in terms of their antisocial behaviour, mental health profile, environmental factors, and fire specific factors, as well as risk for future offending. Although only exploratory, this suggests the potential for empirically derived firesetting typologies.

In this sample, the many relationships between firesetting, conduct problem behaviours and ongoing offending, support the idea that for at least a significant proportion of deliberate firesetting children and adolescents, firesetting may be best understood within the framework of antisocial behaviour.

The research suggests antisocial behaviour is likely to need to be addressed in tandem with firesetting behaviour. Appropriate referral of high-risk children and adolescents who receive the FAIP is extremely important. Thus, the development and implementation of accurate risk assessments is crucial. Ultimately, children and adolescents who deliberately light fires are a heterogeneous population, and assessment and treatment must be highly individualised and appropriate for the specific client and their needs.

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**Risk factors and offending behaviours among children and adolescents who deliberately light fires**

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# **Abstract**

## **Purpose**

The purpose of the current study is two-fold. Firstly, to draw upon longitudinal data on child firesetters who were referred to the New Zealand Fire Service Fire Awareness and Intervention Programme (FAIP) and secondly, to investigate the relationship between conduct problems, firesetting behaviour and subsequent offending, to gain a better understanding of the risk factors for firesetting and offending behaviours amongst a firesetting population. Additionally, the current study aims to investigate whether there are distinct clusters of firesetters that have similar characteristics, risk factors and comorbid pathology relating to their behaviour/s, and to what extent these clusters in the sample resemble those present in the existing body of literature.

## **Method**

The sample for the current study included all children and adolescents throughout New Zealand who were referred to the FAIP between 1 July 2003 and 30 June 2007, and who met the sample inclusion criteria (N = 1790). The sample inclusion criteria was that an individual had been directly involved in the intentional lighting of a fire, and was under 18 years of age at the time of intervention. Data was provided by and collected from the New Zealand Fireservice FAIP questionnaire, Child Youth and Family Care and Protection records, the New Zealand Police database of offending records, and the Ministry of Education intervention records. Data were analysed quantitatively using JMP V10.0 (SAS Inc.) using Pearson's chi-squared ( $\chi^2$ ) tests, logistic regression analyses, multivariable modelling and cluster analysis.

## **Results**

Overall, the sample had a number of serious environmental, psychosocial/emotional and behavioural difficulties. The Ministry of Education outcomes with the highest percentage of occurrences were for Stand downs, Suspensions and NETS, suggesting that school disruption as a result of problematic behaviour is common in this population.

Males were significantly more likely to have had a diagnosis of ADHD than their female counterparts (17% versus 3.7%), and were also more likely to have problems with hyperactivity and concentration. Males and females had similar rates of behavioural problems and, for those who had engaged in four or more conduct problem behaviours, antisocial behaviour was very prevalent. However, males had increased severity and frequency of this behaviour, particularly as they get older.

Many differences found between age groups (children and adolescents) were expected given normative development. When compared to child offenders, adolescents committed more severe offences, were more likely to offend in groups, and overall displayed more antisocial traits than child firesetters.

For the most part, the variables that were associated with offending in this sample were those also known to be associated with offending in other samples within the literature. The high rates of offending

in this sample, in addition to the many relationships between firesetting, conduct problem behaviours and ongoing offending, support the idea that for at least a significant proportion of deliberate firesetting children and adolescents, firesetting may be best understood within the framework of antisocial behaviour.

Cluster analysis derived a five cluster solution which comprised five distinct clusters that differed in terms of their antisocial behaviour, mental health profile, environmental factors, and fire specific factors, as well as risk for future offending. Although only exploratory, this suggests the potential for empirically derived firesetting typologies.

### **Key Recommendations**

The findings of the current study have a number of theoretical and practical implications. This study has identified that many children and adolescents who are referred to the FAIP come from multi-problem and chaotic families, and have high needs in a range of areas. In addition, antisocial behaviour was highly prevalent in this population, suggesting antisocial behaviour is likely to need to be addressed in tandem with firesetting behaviour. Appropriate referral of high-risk children and adolescents who receive the FAIP is extremely important. Thus, the development and implementation of accurate risk assessments is crucial. Ultimately, children and adolescents who deliberately light fires are a heterogeneous population, and assessment and treatment must be highly individualised and appropriate for the specific client and their needs.

Future research should consider gender and age differences in analysis of risk for offending behaviour. Additionally, there is a need for research which looks to empirically derive firesetting subtypes in a range of samples, including those referred to interventions such as the FAIP, as well as in community samples.



# **Risk factors and offending behaviours in children and adolescents who deliberately light fires**

## **Introduction**

According to research drawing on community samples, around 5–67% of children and adolescents, and around 2-3 times more boys than girls engage in firesetting behaviour (Chen, Arria & Anthony, 2003; Dadds & Fraser, 2006; Del Bove, Caprara, Pastorelli, & Paciello, 2008; MacKay, Paglia-Boak, Henderson, Marton & Adlaf, 2009; Martin, Bergen, Richardson, Roegar & Allison, 2004). Firesetting is potentially very damaging and costly, and concerningly, approximately 50% of firesetters in community samples are involved in recurrent firesetting behaviour (Del Bove et al., 2008; MacKay et al., 2009) and research reports recidivism rates of up to 59% (Del Bove, Marton, Warling, & Root, 2006; Kolko, Day, Bridge & Kazdin, 2001; Kolko & Kazdin, 1992; Mackay, Henderson). In New Zealand in 2011, individuals younger than 17 accounted for 54% of apprehensions for property damage by fire or explosion and those under 21 for 71% (Statistics New Zealand, 2012). Similarly, youth under the age of 18 typically comprise around 45% of all arrests for arson in the United States (Puzzanchera, Adams, & Kang; 2012).

Despite the heterogeneity of firesetting populations, likely multiple developmental pathways to firesetting behaviour and the empirical identification of several risk factors for and correlates of firesetting (see Lambie & Randell, 2011 for a review), a precise understanding of the mechanisms involved in the development and maintenance of firesetting is lacking. Literature indicates that some firesetters are less pathological, experiencing relatively functional environments and exhibiting fewer behavioural or emotional disturbances. Firesetting for these individuals may be the result of boredom, access to ignition sources and lack of fire safety knowledge and supervision, although such a conclusion cannot be assumed without further investigation. In contrast, the behaviour of pathological firesetters is most comprehensively described by Fineman's (1995) dynamic-behavioural model, as the result of 'an interaction between dynamic historical factors that predispose the firesetter toward a variety of maladaptive and antisocial acts, historical environmental factors that have taught and reinforced firesetting as acceptable, and immediate environmental contingencies that encourage firesetting behaviour'.

The majority of interventions for firesetters are fire service operated and involve fire safety education (Palmer, Caulfield & Hollin, 2007). Although fire safety education is likely to be important in addressing problematic fire-related behaviours, research linking firesetting to wider antisocial behaviour and offending (Forehand, Wierson, Frame, Kemptom & Armistead, 1991; Lambie, Ioane, Randell & Seymour, 2013; Martin et al., 2004; Stickle & Blechman, 2002) suggests that it is unlikely to be sufficient. Research is needed to further investigate the nature of this relationship and the implications that it may have for intervention approaches with firesetters.

## **Method**

### **The Current Study**

The purpose of the current study is twofold. Firstly, to draw upon longitudinal data on child firesetters who were referred to the New Zealand Fire Service Fire Awareness and Intervention Programme (FAIP) and secondly, to investigate the relationship between conduct problems, firesetting behaviour and subsequent offending, to gather a better understanding of the risk factors for firesetting behaviours and offending behaviours amongst a firesetting population. Additionally, the study aims to investigate whether there are distinct clusters of firesetters in the sample that have similar characteristics, risk factors and comorbid pathology relating to their behaviour and to what extent these clusters resemble those present in the existing body of literature.

The New Zealand Fire Awareness and Intervention Program (FAIP) is a nation-wide educational program, established in 1992 and available for youth up to the age of 18, who have engaged in concerning fire related behaviours. The FAIP is typical of fire service directed educational programs that operate worldwide. The primary aim of the FAIP is to reduce the incidence of fire related behaviours and increase the acquisition of fire safe attitudes, knowledge and appropriate behaviour through the provision of fire safety education and the promotion of fire safe attitudes and behaviour. Young people are referred to the programme by any person or agency concerned about a child's firesetting, including schools, the New Zealand Police, parents/caregivers and members of the public. Interventions are delivered by fire fighters who have undergone specific training in delivering FAIP interventions. The intervention usually takes place in the home of the young person with parents, caregivers or another appropriate adult present. The duration of an intervention meeting is usually an hour to an hour and a half. The intervention format is a semi-structured interview using a standard questionnaire involving discussion with both the parent and child and also involves fire safety education for both the child and parents. If the practitioner considers it necessary, follow up phone calls, further intervention appointments and referrals can be made (Lambie, Seymour & Popaduk, 2012). One advisory psychologist acts in a supporting role for practitioners, and are able to provide advice concerning appropriate referrals or to discuss other concerns a practitioner may have about a child.

### **Sample**

The sample for the current study included all children and adolescents throughout New Zealand who were referred to the FAIP between 1 July 2003 and 30 June 2007, and who met the sample inclusion criteria (N = 1790). Inclusion in the sample required that an individual had been directly involved in the intentional lighting of a fire, and was under 18 years of age at the time of intervention. Of the children who received an FAIP intervention during this period (N = 2696), 906 individuals were excluded on the basis of the following: insufficient personal information, their referral to the FAIP resulted from fire-related behaviours other than actual engagement in fire setting activity, accidental firesetting or missing data. The majority of these exclusions from the sample involved accidental firesetting. This resulted in a

final sample size of  $N=1790$ . The final sample consisted of 1602 males and 188 females ranging between 3.6 and 17.9 years of age ( $M = 11.8$ ;  $SD = 3.2$ ).

## Procedure

Following approval and commission from the New Zealand Fire Service to undertake this study, ethical approval was granted by the University of Auckland Human Subjects Ethics Committee (No. 7792). Data was provided by or collected from the New Zealand Fire Service, The New Zealand Police National Intelligence Agency database (NIA), and the Child Youth and Family (CYF) national database (CYRAS) and the Ministry of Education (MoE). The names and matching dates of birth of the selected sample of FAIP participants were searched on NIA, in CYRAS (the CYF database) and in the Ministry of Education (MoE) database.

Data provided by the New Zealand Fire Service concerned all individuals who had participated in the FAIP intervention programme between 01 July 2003 and 30 June 2007. The dataset provided by the New Zealand Fire Service was sourced from its annual national child database and included demographic, fire-specific, behavioural, health and mental health information recorded as part of the FAIP questionnaire. Data supplied by the New Zealand Fire Service included all individual, environmental, and fire specific information collected using a standardised questionnaire during the FAIP intervention interview. This information was provided by the child/adolescent and their parent/caregiver or other adult in attendance.

Child Youth and Family is a service provided by the New Zealand Ministry of Social Development and is the statutory child protection agency for New Zealand. Data collected from CYRAS was drawn from care and protection and placement file data entries prior to the date of FAIP intervention. Forty-four percent ( $n = 793$ ) of the current sample, including 43.8% of males ( $n = 702$ ) and 48.4% of females ( $n = 91$ ), had care and protection histories prior to their intervention. Variables of interest in CYRAS included victimisation and placement histories, suicidal tendencies, sexualised behaviour and domestic violence experiences. Data was collected by two researchers who read Care and Protection file histories in their entirety and recorded whether variables of interest were present or not based on a predetermined set of criteria. Ten percent of the total sample ( $n = 180$ ) was randomly selected for analysis of interrater agreement to determine consistency between the two data collectors. Of these, 116 had records in CYRAS and the analysis was therefore limited to these 116 subjects. Below is displayed the interrater agreement for a randomly selected number of cases ( $n = 116$ ) that had care and protection file data in CYRAS prior to the date of FAIP intervention. The Cohen's Kappa values were all greater than .75 thus falling within the range of excellent agreement (Cicchetti et al., 2006).

Table 1

*Interrater Agreement for the Child Youth and Family Database (CYRAS) File Data Variables*

Variable	% Agreement	Kappa
Suicide/self-harm	100	1
Any placement	97.4	0.92
Multiple placements	99.1	0.96
5+ placements	99.1	0.9
Physical abuse	92.2	0.83
Sexual abuse	95.7	0.81
Domestic violence - present	98.3	0.96
Domestic violence - witnessed	94	0.77
Sexualised behaviour	98.3	0.92

*Note.* Kappa values of 0.60-0.74 = good agreement and  $\geq 0.75$  = excellent agreement (Cicchetti et al., 2006).

Access to the National Intelligence Application (NIA) was granted through Police - Counties Manukau Community Services Team to its Research and Ethics Subject Committee (RESC). NIA is a database within the Police which contains information on all persons who have current or previous involvement with police. This database involves sharing information and integrating interfaces between Police, Ministry of Justice, Department of Corrections, and Land Transport Safety Authority. Offending histories provided by the New Zealand Police included the subjects' entire offending histories from birth up until the time of data collection (October 1 – December 14, 2012). Offence records were drawn from both Youth Aid and Court records and included type of offence and outcome of offending. With the intention of capturing broad indications of conduct problem behaviour, all offences were recorded, regardless of outcome and even in an individual was under the legal age of criminal responsibility and unable to be charged. Information sourced from NIA included the individual's entire offence history (including date of offence, offence type and offence outcome and custody) from both adult and youth records.

### **Variables used in the current study**

The following variables were drawn from data collected by the FAIP questionnaire:

- *Age at referral* indicates whether an individual was a child (age 11 or younger) or adolescent (age 12+) at the date of FAIP intervention.
- Gender
- Ethnicity
- *Deprivation Score* describes the general socioeconomic deprivation of the area in which an individual was living as defined by the New Zealand Index of Deprivation (Salmond, Crampton, & Atkinson, 2007). Scores range from 1 to 10, where 10 represents the areas with the greatest levels of deprivation.

- *Referred on to another agency* indicates whether the individual was referred to another agency from the FAIP. Response options were 'yes', 'no decision made yet,' or 'no'.
- *Current Residence* indicates whether an individual was living at home, in an institution or in an alternative living situation.
- *Who client lives with* indicates whether an individual was living with a parent, with a caregiver/foster carer or in an alternative living situation.
- *Ever been given a psychiatric diagnosis* was reported in response to the question 'has the client ever been given a psychiatric diagnosis?' Response options were 'yes' or 'no'.
- *Any Current Diagnosis* was reported in response to the question 'Does the client have any of the following diagnoses: Attention-Deficit/Hyperactivity Disorder (ADHD); Conduct Disorder (CD); Oppositional Defiant Disorder (ODD); Obsessive Compulsive Disorder (OCD); Depression'.
- *Psychosocial/emotional difficulties* were reported in response to the question 'Does the client have any of the following problems: Hyperactivity; Poor concentration; Depression; Suicidal/self-harm behaviours; Anger; Anxiety (fear or worrying a lot); Learning difficulties'.
- *Previously referred to Counselling/Formal Mental Health Service* was reported in response to the question 'has the client ever been referred to any form of counselling or formal mental health service?' Response options were 'yes' or 'no'.
- *Currently under referral to* indicates whether the individual was currently under referral to either counselling services, Family GP, Forensic Psychology, Justice, Mental Health, Police, Private Agencies, Social Welfare, or none.
- *Client stress* was reported in response to the question 'Does the client report any current stress in the family?' Response options were 'yes' or 'no'.
- *Head Injury* indicates whether the client has suffered from a head injury. Response options were 'yes' or 'no'.
- *Conduct Problems* were reported in response to the question 'Has the client been involved in any of the following behaviours: Stealing; Stealing by confronting a victim; Burglaries; Often bullies, threatens or intimidates others; Often initiates physical fights; Has used a weapon that can cause serious physical harm to others; Has been physically cruel to people; Has been physically cruel to animals; Vandalism/violence towards property; Tagging; Group offending; Often lies; Running away from home; Drug abuse; Alcohol abuse; Has broken into someone else's house; Often truant from school; Has been sexual offending'. Response options were 'yes' or 'no'.
- *Aggression to People and Animals* was made up of the Conduct Problems variables 'Has used a weapon that can cause serious physical harm to others,' 'Has been physically cruel to people,' 'Has been physically cruel to animals,' 'Stealing by confronting a victim,' 'Often bullies, threatens or intimidates others,' 'Often initiates physical fights,' 'Has been sexual offending'.
- *Deceitfulness or Theft* was made up of the Conduct Problem variables 'Stealing,' 'Often lies,' 'Has broken into someone else's house,' and 'Burglaries'.
- *Destruction of Property* was made up of the Conduct Problem variables 'Vandalism/violence towards property,' and 'Tagging'.
- *Serious Violation of Rules* was made up of the Conduct Problem variables 'Running away from home,' 'Often truant from school,' 'Drug abuse,' and 'Alcohol abuse'.

- *Four or more Conduct Problems* refers to the client exhibiting four or more of the Conduct Problem variables
- *How many times has the client used fire inappropriately.* Response options were 'Once'; '2-4 times'; 'More than 4 times'.
- *Location of referral fire incident* indicates whether the referral firesetting event occurred at home, or at school.
- *Motivation* was reported in response to the question 'Why did the (alleged) firesetting occur (motivation)?' Response options included: Anger; Attention; Boredom; Experiment; Peer pressure; Revenge; Conceal a crime; Unable to identify a reason. Multiple motivations were able to be selected.
- *Antisocial Motivation* was made up of the Motivation variables 'Anger,' 'Revenge', and 'Conceal a crime'.
- *Destruction of property intended* indicates whether destruction of property was intended in relation to the referral firesetting incident.
- *Client part of group at time of fire* indicates whether an individual was part of a group at the time of the referral firesetting incident.
- *Was there an accelerant used* indicates whether or not accelerant was used in the referral firesetting incident.
- *Client trying to harm other people by setting fire to property.*
- *Client trying to set fire to other people.*
- *What did the client do after the fire started* indicates whether they Put it out/tried to put it out, Called for help, Ran away, Stayed and watched, or Other after the referral fire started.

The following variables concerning victimisation were created by combining FAIP and CYRAS victimisation variables. This collation of multiple data sources was intended to minimise the effects of underreported victimisation and increase accuracy of data.

- *Physical abuse* was determined by *either* a selection of 'physical' in response to the FAIP questionnaire item 'Does the caregiver or any of the family report any actual abuse to the client, past or present?' *or* any indication of physical abuse victimisation CYRAS file data prior to the date of intervention in. An indication of physical abuse in CYRAS constitutes a description of victimisation in relation to an individual using the term 'physical abuse', or any indication of physical harm to an individual occurring in the home environment (i.e. not fights at school) and excluding open handed smacks on the bottom.
- *Sexual abuse* was determined by *either* a selection of 'sexual' in response to the FAIP questionnaire item 'Does the caregiver or any of the family report any actual abuse to the client, past or present?' *or* any indication of sexual abuse victimisation prior to the date of intervention in CYRAS file data. An indication of sexual abuse in CYRAS constitutes a description of victimisation in relation to an individual using the term 'sexual abuse', or any indication of sexual abuse of an individual perpetrated by any other in any location.
- *Neglect* was determined by *either* a selection of 'serious neglect' in response to the FAIP questionnaire item 'Does the caregiver or any of the family report any actual abuse to the client,

past or present?' or any indication of neglect prior to the date of intervention in CYRAS file data.

- *Any experienced abuse* indicates the presence of physical abuse and/or sexual abuse and/or neglect as defined by the above variables.
- *Any physical or sexual abuse* indicates the presence of either or both of physical or sexual abuse victimisation as defined by the above variables.

The following variables were drawn from the Child, Youth and Family database CYRAS.

- *Care and protection involvement* indicates whether an individual had any care and protection entries in CYRAS.
- *Any placement* indicates whether an individual had any care and protection or youth justice residential placement records in CYRAS.
- *Multiple placements* indicate whether an individual had more than one care and protection or youth justice residential placements. Multiple placements at the same residence were counted as a single placement only.
- *5 or more different placements* indicated whether an individual had five or more different care and protection or youth justice placements as defined above.
- *Domestic violence* was determined by any indication of violence in the home environment not directly involving an individual, including physical violence and property damage but not verbal violence.
- *Domestic violence witnessed* was determined by any indication that an individual has witnessed (seen or heard) domestic violence as defined above.
- *Sexualised behaviour prior to age 12* indicates record of an individual displaying inappropriate sexualised behaviour prior to 12 years of age.
- *Suicide or Self-harm indicators* was determined by any clear indications of suicide or self-harm related behaviours including suicide ideation, threats, attempts, self-harming, present as either a suicide alert, reason for notification or noted in case note.

The following variables were created from each individual's offending history extracted from the New Zealand Police Database NIA. For statistical purposes, each variable was split into three sub-variables: (a) 'pre-intervention', (b) 'post-intervention' and (c) 'ever' (pre- and post-intervention).

- *Offended* indicates whether an individual had any offences regardless of outcome. All offences were recorded, even if an individual was under the legal age of criminal responsibility and unable to be charged.
- *Convicted* indicates whether an individual had any recorded offences with an outcome of 'convicted'.
- *Arson* indicates whether an individual had any arson offences.
- *Offending severity group* indicates which of the following, mutually exclusive groups an offender fell into based on their most severe offence: (a) *Severe* - the individual had committed at least one severe offence, (b) *Moderate* - the individual had committed at least one moderate

but no severe offences, (c) *Minor* - the individual had committed at least one minor offence, but no moderate or severe offences. Offence categories were determined in consultation with the New Zealand Police who provided information as to which offences were regarded to be minor, moderate, and severe, based on the extent of damage or harm to an individual and/or property. The offences that fell into each category are listed in *Appendix A*.

- *Offending type* whether an individual had committed any of the following types of offences: Violence; Sexual; Drugs and Antisocial; Dishonesty; Property Damage; Property Abuses; Administrative. The offending categories that fall under each type are listed in *Appendix B*.
- *Previous Offence Count* indicates how many offences the client has committed prior to their FAIP intervention. Responses were grouped as either 'Zero,' '1 or 2', '3 or 4', '5 to 10' or '10+'.

## Data Analysis

Data obtained from the New Zealand Fire Service, Child Youth and Family, the New Zealand Police and the Ministry of Education were analysed quantitatively using JMP V10.0 (SAS Inc.).

To investigate differences between the proportions of males and females and children and adolescents on a range of individual, fire-specific and offending categorical variables, Pearson's chi-squared ( $\chi^2$ ) tests were carried out. To investigate predictors of any post-FAIP intervention offence, the severity of offence (used an ordinal measure - none/minor, moderate, severe), and any arson offence, logistic regression analyses were conducted. A nominal  $p$ -value  $< 0.05$  was used for statistical significance for assessing univariable associations.

Multivariable modelling was used to evaluate which variables were primary and independent predictors for post-FAIP intervention offences. Variables that were associated in the univariable analyses were incorporated into models in a forward step-wise fashion, starting with variables that were most strongly associated as measured by univariable R-squares. Only variables that increased the multivariable R-square value by  $> 0.05$ , and were significant at  $p$ -value  $< 0.005$  were accepted as independent predictors providing a meaningful contribution to the outcome. The predictive ability of the models was assessed by sensitivity and specificity measures including the area under the receiver operating characteristic curve (ROC AUC).

Cluster analysis of FAIP clients was undertaken using hierarchical clustering. Variables considered for use in the cluster analysis included those that have been found by research as being associated with firesetting, firesetting severity, or firesetting recidivism. Additionally, factors which have been previously used by authors and practitioners as ways of grouping firesetters were also considered. Measures where the frequency of at least one sub-category was outside the range of 0.15 to 0.85 were excluded as having too little variation to be of practical consequence for clustering. One measure was excluded as having too many missing values. An iterative process, where the relative contribution of variables were assessed, was undertaken to build a final set of variables that clearly differentiated between clusters of FAIP clients. The optimal number of clusters was determined by both practical considerations and the location of the bend in the cluster properties scree plot.



## Sample Descriptors

The following set of tables outline describe the prevalence of a wide range of measures individual, environmental and fire specific variables in the current sample. Demographic and intervention related variables are presented in Table 2, psychosocial/emotional and environmental variables are presented in Table 3, conduct problems and offending related variables are presented in Table 4, and fire specific variables are presented in Table 5.

Table 2

*Frequencies and Percentages of Demographics, Assessment and Intervention Variables*

<i>Variable</i>	<i>Frequency</i>	<i>Percentage*</i>
<b>Age at referral</b>		
3	2	.1%
4 to 5	92	5.1%
6 to 7	165	9.2%
8	110	6.2%
9	159	8.9%
10	141	7.9%
11	140	7.8%
12	174	9.7%
13	292	16.3%
14	260	14.5%
15	136	7.6%
16	95	5.3%
17	24	1.3%
<b>Gender</b>		
Male	1602	89.5%
Female	188	10.5%
<b>Ethnicity</b>		
European	1191	67.7%
Asian	15	0.85%
Maori	461	26.2%
Pacific	78	4.4%
Other	15	0.85%
<b>Deprivation Score</b>		
1	101	5.9%
2	110	6.5%
3	94	5.5%
4	131	7.7%
5	164	9.7%
6	171	10.1%
7	175	10.3%

8	226	13.3%
9	237	13.9%
10	291	17.1%
<b>Intervention Year</b>		
2003	302	16.9%
2004	475	26.5%
2005	430	24.0%
2006	426	23.8%
2007	157	8.8%
<b>Referred by</b>		
Public/Family	451	25.2%
Fireservice	237	13.2%
School	290	16.2%
Police	343	19.2%
YouthAid	286	16.0%
Social Welfare/CYPFA	52	2.9%
Public Health Facility	49	2.7%
FGC Co-ordinator	82	4.6%
<b>Referred to</b>		
Counselling services	37	2.1%
Family GP	6	0.34%
Forensic Psychology	4	0.23%
Justice	7	0.40%
Mental Health	22	1.3%
None	1505	85.8%
No decision made yet	111	6.3%
Police	39	2.2%
SWCYPFA	22	1.3%
<b>Adult attendance at interview</b>		
Family member	1597	89.3%
Caregiver	117	6.5%
Other	74	4.1%
<b>Current Residence</b>		
Home	1690	94.5%
Institution	34	1.9%
Other	64	3.6%
<b>Who client lives with</b>		
Parents	1601	89.5%
Caregiver or Foster	115	6.4%
Other	73	4.1%

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Note: \*The percentage represents the percentage of subjects who exhibited that characteristic

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Table 3

*Frequencies and Percentages of Psychosocial/Emotional and Environmental Variables*

<i>Variable</i>	<i>Frequency</i>	<i>Percentage*</i>
<b>Ever been given a psychiatric diagnosis</b>		
Yes	323	18.0%
<b>Current psychiatric diagnosis</b>		
Any	390	21.8%
Multiple	157	8.8%
Attention Deficit Hyperactivity Disorder	279	15.6%
Conduct Disorder	80	4.5%
Oppositional Defiant Disorder	92	5.1%
Obsessive Compulsive Disorder	29	1.6%
Depression	74	4.1%
Anxiety	64	3.6%
Aspergers Syndrome	30	1.7%
<b>Psychosocial/Emotional problems</b>		
Any	1019	57.0%
Multiple	743	41.5%
Hyperactivity	394	22.0%
Poor concentration	655	36.6%
Depression	150	8.4%
Suicidal/self-harm behaviours	117	6.5%
Anger	640	35.8%
Anxiety – fear or worrying a lot	333	18.6%
Learning difficulties	520	29.1%
<b>Previously referred to counselling/formal mental health service</b>		
Yes	590	33.0%
<b>Currently under referral to</b>		
None	1189	66.5%
Counselling services	170	9.5%
Family GP	81	4.5%
Forensic Psychology	13	0.73%
Justice	26	1.5%
Mental Health	138	7.7%
Police	163	9.1%
Private Agencies	42	2.4%
Social Welfare	154	8.6%
<b>Experienced Abuse</b>		
Any	678	38.2%
Physical abuse	494	27.8%
Sexual abuse	267	15.1%
Neglect	406	22.9%
Physical and/or Sexual	568	32.0%
<b>Client report stress in the family</b>		
Yes	562	31.6%
<b>Family had major health/physical problems or disabilities</b>		
Yes	396	22.2%
<b>On any medication</b>		
Yes	340	19.1%

<b>Client suffered from a head injury</b>		
Yes	270	15.2%
<b>Anyone in the household smoke</b>		
Yes	1153	64.4%
<b>Smoke alarms installed in home</b>		
Yes	1395	78.0%
<b>Involvement with CYF</b>		
Yes	801	45.1%
<b>Placement</b>		
Any	210	11.8%
Multiple	144	8.1%
5 or more	63	3.6%
<b>Domestic violence present</b>		
Yes	334	18.8%
<b>Domestic violence witnessed by client</b>		
Yes	225	12.7%
<b>Suicide or self-harm indications</b>		
Yes	85	4.8%

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*Note:* \*The percentage represents the percentage of subjects who exhibited that characteristic

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Table 4

*Frequencies and Percentages of Conduct Problem Behaviours and Previous Offences*

<i>Variable</i>	<i>Frequency</i>	<i>Percentage*</i>
<b>Conduct Problem behaviours</b>		
Any	323	18.0%
Multiple	1467	82.0%
Aggression toward People and Animals	568	31.7%
Deceitful or Theft	946	52.8%
Destruction of Property	475	26.5%
Serious violation of rules	511	28.5%
Vandalism	421	23.5%
Tagging	139	7.8%
Burglary	110	6.2%
Initiates physical fights	280	15.6%
Has used a weapon	160	8.9%
Bullies, threatens, intimidates others	369	20.6%
Been physically cruel to people	226	12.6%
Been physically cruel to animals	98	5.5%
Stealing	674	37.7%
Stealing by confronting victim	38	2.1%
Group offending	366	20.5%
Often lies	700	39.1%
Running away from home	316	17.7%
Drug abuse	91	5.1%
Alcohol abuse	82	4.6%
Broken into someone else's house	78	4.4%
Often truant from school	283	15.8%
Sexual offending	23	1.3%
Four or more conduct problem behaviours	550	30.7%
<b>Sexualised behaviour before age 12</b>	174	9.8%
<b>Previous offences</b>		
Any	664	37.1%
Severe offence	50	2.8%
Moderate offence	606	33.9%
Minor offence	222	12.4%
<b>Previous conviction for offence</b>	38	2.1%
<b>Previous Offence Count</b>		
Zero	1126	62.9%
1 or 2	495	27.6%
3 or 4	91	5.1%
5 to 10	61	3.4%
10+	17	.95%
<b>Type of previous offence</b>		
Arson	406	22.7%

Administrative	9	.50%
Traffic	23	1.3%
Violence	101	5.6%
Sexual	12	.67%
Property damage	536	29.9%
Miscellaneous	76	4.3%
Drugs and antisocial behaviour	73	4.1%
Dishonesty	257	14.4%
<b>Offending post-intervention</b>		
Any	1105	61.7%
Severe offence	361	20.2%
Moderate offence	994	55.5%
Minor offence	810	45.3%

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*Note:* \*The percentage represents the percentage of subjects who exhibited that characteristic

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Table 5  
*Frequencies and Percentages of Fire Specific Variables*

<i>Variable</i>	<i>Frequency</i>	<i>Percentage*</i>
<b>How many times has client used fire inappropriately</b>		
First time	675	39.5%
2 to 4 times	626	36.6%
More than 4 times	407	23.8%
<b>Historic damage – estimated cost</b>		
No value	1540	90.0%
\$200	72	4.2%
\$500	28	1.6%
\$1,000	26	1.5%
\$5,000	22	1.3%
\$10,000	6	0.35%
\$20,000	8	0.5%
\$50,000	1	0.06%
\$80,000	3	0.2%
\$100,000	1	0.06%
\$150,000	2	0.11%
\$200,000	2	0.11%
<b>Location of referral fire incident</b>		
Home	564	31.5%
School	536	29.9%
Away from Home	702	39.2%
<b>Motivation</b>		
Antisocial	134	7.5%
Anger	110	6.2%
Attention	97	5.4%
Boredom	547	30.6%
Experiment	482	26.9%
Peer Pressure	285	15.9%
Revenge	21	1.2%
Conceal a Crime	11	0.6%
Unable to identify a reason	369	20.6%
Other	38	2.1%
<b>Destruction of property intended</b>		
Yes	227	12.7%
<b>Reported having discovered the fire</b>		
Yes	246	13.8%
<b>Client part of a group at the time of fire</b>		
Yes	1368	76.4%
<b>Number of people in the group at the time of fire</b>		
2	221	44.5%
3 to 5	243	48.9%

6 or more	33	6.6%
<b>What material was used to light the fire</b>		
Candles	22	1.2%
Fireworks	27	1.5%
Lighter	1271	71.1%
Matches	445	24.9%
Heating device	106	5.9%
<b>Where did the client get the material to light the fire</b>		
Home	718	40.1
Shop	241	13.5
Peers	479	26.8
Other	371	20.7
<b>Was there an accelerant used</b>		
Yes	406	22.7%
<b>Client trying to harm other people by setting fire to property</b>		
Yes	15	0.8%
<b>Client trying to set fire to other people</b>		
Yes	25	1.4%
<b>Client aware of Fire Safety Education programmes</b>		
Yes	1122	62.7%
<b>How did lighting the fire make the client feel</b>		
Positive Feelings	445	24.9%
Negative Feelings	811	45.3%
Happy	71	4.0%
Scared	651	36.5%
Ashamed	206	11.5%
Excited	261	14.6%
Relaxed	135	7.6%
Other	20	1.1%
Unable to identify feelings	543	30.4%
<b>What did the client do after the fire started</b>		
Put it out/tried to put it out	828	46.5%
Called for help	86	4.8%
Ran away	586	32.9%
Stayed and watched	376	21.1%
Other	11	0.6%

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*Note: \*The percentage represents the percentage of subjects who exhibited that characteristic*

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## Discussion

The majority of individuals in the sample (68%) were European, 26% were Maori, 4% were Pacific Islanders, 1% were Asian, and 1% of the sample identified with another ethnic group. The vast majority (89.5%) of the sample were male.

For almost 40% of the sample, the referral firesetting incident was the first time that they had engaged in inappropriate fire use, while 37% of the sample reported having used fire inappropriately 2 to 4 times and 24% of the sample reported having used fire inappropriately more than 4 times. This suggests that firesetting is more often a multiple rather than one-off behaviour for deliberate firesetters referred to the FAIP. There was significant diversity in the details related to the firesetting behaviours of the sample. Destruction of property was intended by 12% of the sample but less than 1% of the sample intended to harm other people by setting fire to property and only 1% of the sample were trying to set fire to other people. The most commonly reported reason for firesetting was boredom (31%) followed closely by experimentation (27%). While experimentation is commonly discussed in firesetting literature, boredom is often overlooked and this finding suggests that further research should take this variable into account. For a majority of the sample (76%) firesetting was a group activity, which likely reflects the importance of peer influence in the development of antisocial behaviour (McGloin, 2009; Tolan, Gorman-Smith, & Henry, 2003). Almost a third of firesetting incidents occurred at home. The most commonly reported material used to light the fire was a lighter (71%) and 23% of the sample used an accelerant in their firesetting. Feeling scared in relation to lighting the fire was most common and was reported by over a third (36%) of the sample. Feeling scared was the only feeling reported by over 15% of the sample. The most commonly reported action after the fire started was attempting to put it out (47%). Thirty three percent of the sample ran away after the fire started and 21% of the sample stayed and watched after the fire started. Relatively few individuals in the sample called for help (5%).

The vast majority of the sample (95%) were living at home rather than in an institution at the time of intervention and 89% of the sample reported living with their parents, 6% with a caregiver or in foster carer and 4% of the sample reported living with someone other than parents or caregiver. Despite living at home, it appears that a significant proportion of individuals in this sample experienced backgrounds characterised by family dysfunction and abuse. Forty five percent of the sample reported having a care and protection history prior to FAIP intervention, domestic violence was present in the homes of 42%, 28% had witnessed domestic violence, and 38% of the sample reported experiencing physical abuse, sexual abuse or neglect. Fifteen of the sample reported having experienced sexual abuse, 28% of the sample reported having experienced physical abuse, and 22% of the sample reported having experienced neglect. Such high rates of abuse and family dysfunction are similar to other studies on adolescent firesetters (Kolko & Kazdin, 1990; Martin et al., 2004; Root et al., 2008; Walsh, Lambie., & Stewart, 2004).

In regards to mental health, 18% of the sample had been given a psychiatric diagnosis and 33% of the sample had previously been referred to counselling or a FMHS. The majority of psychiatric diagnoses were reported by 5% or less of the entire sample, including Conduct Disorder (5%), Oppositional Defiant Disorder (5%), Depression (4%) and Anxiety Disorder (4%). Diagnoses of Obsessive

Compulsive Disorder (OCD) (2%) and Asperger's Syndrome (2%) were rare. Attention Deficit Hyperactivity Disorder (ADHD) (16%) was the most prevalent diagnosis in the sample. ADHD symptoms also prevalent in reports of psychosocial/emotional problems were more common with 37% of the children having poor concentration, 22% reported as having problems with hyperactivity. Learning difficulties were prevalent in 29% of the sample, though it is highly likely that some of these may be related to the prevalence of ADHD symptoms. Additionally, problems with anger were reported for over a third of the sample (36%) 19% of the sample reported anxiety. The least commonly reported problems were suicidal/self-harm behaviours (7%) and depression (8%).

Behavioural problems were relatively prevalent in the sample of this study, with almost a third of the sample (31%) were reported to have engaged in four or more of the conduct problem behaviours measured. The most commonly reported behaviours were often lying (39%) and vandalism (24%). Other commonly reported behaviours were bullying, threatening and intimidating others (21%) and group offending (20%). The least commonly reported behaviours were sexual offending (1%) and stealing by confronting a victim (2%). Twenty two percent of the sample had Child Youth and Family records of engagement in inappropriate sexualised behaviour prior to age 12.

Following their FAIP intervention, 38% of the sample were not involved in any offending, 5% of the sample were involved in minor offending, 37% of the sample were involved in moderate offending, and 20% of the sample were involved in severe offending. That over half the sample went on to engage in moderate or severe offences is concerning and highlights the high risk nature of many individual who set intentional fires and are involved with the FAIP (see Lambie & Randell, 2011 for a review).

Despite their apparent high needs, a majority of the sample (67%) were not involved with other agencies at the time of the intervention, and only 14% were not referred on to other agencies or services by the Fire Service following their contact with the FAIP. This apparent lack of awareness of the severity of the problems which characteristically underlie firesetting behaviour is of concern, particularly given that a high percentage of children in the sample (57%) go onto to offend to a moderate or severe level.

## Summary

- There were high rates of offending after the FAIP intervention in the current sample.
- 62% of the sample had post-intervention offences (5% minor, 37% moderate and 20% severe).
- Behavioural problems were quite prevalent in the sample of this study, with almost a third of the sample having reported to have engaged in four or more of the conduct problem behaviours measured. The most commonly reported behaviours were often lying (39%) and vandalism (24%).
- With the exception of ADHD, there were low rates of psychiatric diagnoses but psychosocial/emotional problems were more common.
- Care and protection histories were common (45%) as were histories of abuse or neglect (38%).
- Overall, the sample has a number of serious environmental adversity, psychosocial/emotional difficulties and severe behavioural problems.

## **Ministry of Education Interventions**

### **Ministry of Education Data**

Information from the Ministry of Education was sourced from two main databases. The Te Pataka database which was implemented in 1998 was used gain data concerning students that had involvement with the Ministry of Education – Special Education. Te Pataka has been replaced by another Ministry of Education database. The ENROL database is an electronic enrolment management system that was implemented across the country by the end of 2007.

The table below provides an overview of the data collected. The following information will provide a definition for each Ministry of Education intervention followed by an explanation of the results, pre-FAIP and post-FAIP intervention. All clients (n=1790) in this study have been documented in the “All Clients” section of Table 6. Data is also presented as percentages of clients with any MoE intervention (pre-FAIP sample: n=470; post-FAIP sample: n=874). This group is referred to as “Clients with any MoE intervention” in Table 6.

Given the small percentage outcome for some of the interventions, we have only commented on interventions that were received by more than 5% of the sample.

Table 6  
 Ministry of Education Intervention Data Prior to and Following FAIP Intervention

Variables	Pre-FAIP Intervention All Clients		Pre-FAIP Intervention in clients with any MOE Intervention (n = 470)	Post-FAIP Intervention		Post-FAIP Intervention in clients with any MOE Intervention (n = 874)
	n	%	%	n	%	%
<b>MOE intervention</b>						
Yes	470	26.3%		874	48.8%	-
<b>Alternative education</b>						
Yes	23	1.3%	4.9%	205	11.5%	23.5%
<b>Boarding bursaries</b>						
Yes	1	0.056%	0.21%	8	0.45%	0.915%
<b>Early Leaving Exemptions</b>						
Yes	7	0.39%	1.5%	132	7.37%	15.1%
<b>ESOL</b>						
Yes	46	2.57%	9.8%	2	0.11%	0.229%
<b>Homeschooling</b>						
Yes	8	0.45%	1.7%	10	0.56%	1.1%
<b>Non-Enrolment Truancy Services</b>						
Yes	26	1.45%	5.5%	375	20.9%	42.9%
<b>ORRS</b>						
Yes	8	0.45%	1.7%	14	0.78%	1.6%
<b>Resource Teachers: Literacy</b>						
Yes	1	0.056%	0.21%	11	0.62%	1.3%
<b>Section 9</b>						
Yes	7	0.39%	1.5%	59	3.3%	6.75%
<b>Special Education Service</b>						
Yes	10	0.56%	2.1%	24	1.3%	2.75%
<b>Stand downs</b>						
Yes	355	19.8%	75.5%	627	35.0%	71.7%
<b>Suspensions</b>						
Yes	131	7.3%	27.9%	336	18.8%	38.4%
<b>Special School</b>						
Yes	-	-	-	12	0.67%	1.4%
<b>Reading Recovery</b>						
Yes	-	-	-	9	0.50%	1.0%
<b>Off Site Centers</b>						
Yes	-	-	-	11	0.615%	1.3%
<b>Mapihi Pounamu</b>						
Yes	-	-	-	13	0.726%	1.5%

## **Discussion**

### ***Alternative Education***

Alternative Education programmes are available for all 13 to 15 years olds who have become alienated from school. Alternative Education programmes deliver education in a different setting and use non-traditional methods.

#### *Pre-FAIP intervention (all clients)*

1.3% of all clients in this study were attending alternative education programmes prior to the FAIP intervention.

#### *Post-FAIP intervention (all clients)*

11.5% of all clients in this study attended alternative education programmes.

It appears that there was an increase in the number of those attending alternative education programmes post-intervention perhaps suggesting an accumulation of problems that these clients experienced that ultimately led to their alienation from mainstream education.

#### *Pre-FAIP intervention (MoE clients)*

Of the number of clients in this study that received MoE intervention, 4.9% received an alternative education programme.

#### *Post-FAIP intervention (MoE clients)*

Of the number of clients in this study that received MoE intervention, 23.55% received an alternative education programme.

Again, there is an increase in the number of clients that engaged in alternative education programmes..

### ***Boarding Bursaries***

A funding grant that contributes to boarding fees to allow students to access appropriate schooling the enhance achievement.

### ***Early Leaving Exemptions***

Children and youth in New Zealand are required by law to attend school. An Early Leaving Exemption can be applied for by parents of students from age fifteen, to exempt them from further schooling due to a number of issues such as conduct behaviour problems. Parents are required to provide evidence that their child will transition to a training programme or employment prior this exemption being granted.

#### *Pre-FAIP intervention (all clients)*

0.39% of all clients in this study received an Early Leaving Exemption from school.

#### *Post-FAIP intervention (all clients)*

7.37% of all clients in this study received an Early Leaving Exemption from school.

This suggests that some firesetters continue in education and then apply for early exemption from school at the 15 years old.

*Pre-FAIP intervention (MoE clients)*

Of the number of clients in this study that received an MoE intervention, 1.5% received an Early Leaving Exemption from school.

*Post-FAIP intervention (MoE clients)*

Of the number of clients in this study that received an MoE outcome, 15.1% received an alternative education programme.

Again, there is an increase in the number of clients that received an Early Leaving Exemption following FFAIP intervention.

**English Speakers of Other Languages (ESOL)**

ESOL provides English language support programmes to eligible students from refugee and migrant backgrounds.

**Non-Enrolment Truancy Services (NETS)**

Students aged 16 years or younger that have not attended school for 20 days without an appropriate explanation are referred to the NETS services. The responsibility of NETS is to locate these students and to assist in their transition back to education.

*Pre-FAIP intervention (all clients)*

1.45% of all clients in this study were involved in NETS highlighting non-engagement in school.

*Post-FAIP intervention (all clients)*

20.9% of all clients in this study were involved in NETS highlighting non-engagement in school.

This is suggestive of a significant number of clients who did not engage in school for a period of time.

*Pre-FAIP intervention (MoE clients)*

Of the number of clients in this study that received MoE intervention, 5.5% were involved in NETS.

*Post-FAIP intervention (MoE clients)*

Of the number of clients in this study that received MoE intervention, 42.9% were involved in NETS.

Again, there was a significant increase of clients involved in NETS over time.

**Ongoing Reviewable Resources Scheme (ORRS)**

ORRS provides support for children with the highest level of Special Education needs to learn alongside other children at school.

This funding scheme has now been placed with Ongoing Reviewable Scheme (ORS).

### ***Resource Teachers: Literacy (RT:Lit)***

These teachers provide advice and support to schools on how best to meet the needs of students who are considered to be at risk of being illiterate. They also provide tuition for smaller groups of children who may require intensive literacy support.

### ***Section 9***

A Section 9 agreement allows a child or young person to enrol at a special education facility or to continue to be enrolled at a primary, intermediate or secondary school beyond legal age.

### ***Special Education Service***

Provides funding, services and support for children with special needs e.g. behavioural difficulties, communication difficulties and physical difficulties.

### ***Stand downs***

Stand downs involve the formal removal of a student from school for a specific period of time. A student can be stood down from school for five days or less during the term; or ten days or less in a year.

#### *Pre-FAIP intervention (all clients)*

19.8% of all clients in this study had been stood down from school prior to the FAIP intervention.

#### *Post-FAIP intervention (all clients)*

35.0% of all clients in this study had been stood down from school at some point thereafter following their engagement with FAIP.

#### *Pre-FAIP intervention (MoE clients)*

Of the number of clients in this study that received an MoE outcome, 75.5% were stood down from school.

#### *Post-FAIP intervention (MoE clients)*

Of the number of clients in this study that received an MoE outcome, 71.7% were stood down from school.

Significant proportions of the sample had received stand downs, suggesting that school disruption as a result of problematic behaviour is common in this population.



## **Suspensions**

A suspension involves the formal removal of a student from school until the Board of Trustees decide on the outcome during a suspension meeting.

### *Pre-FAIP intervention (all clients)*

7.3% of all clients in this study had been suspended from school prior to their FAIP intervention.

### *Post-FAIP intervention (all clients)*

18.8% of all clients in this study were suspended post FAIP intervention.

It appears that there was an increase in the number of those attending alternative education programmes post-intervention. This suggests that despite an FAIP intervention, there may be other problems that these clients experienced that ultimately led to their alienation from mainstream education. This may also reflect increase in behavioural problems over time and with the transition into adolescence.

### *Pre-FAIP intervention (MoE clients)*

Of the number of clients in this study that received MoE intervention, 27.9% had been suspended from school.

### *Post-FAIP intervention (MoE clients)*

Of the number of clients in this study that received MoE intervention, 38.4% had been suspended from school.

Over a third of clients involved in MoE interventions had been suspended from school suggesting that there are a number of concerns, likely to be behavioural issues regarding these clients that ultimately led to their suspension.

**Although the data from the Ministry of Education is exploratory, the following recommendations are made:**

- A review of the reasons which lead to Stand downs, Suspensions and engagement with NETS. This will provide an opportunity for schools to explore further their engagement with students and seek opportunities to enhance their responsiveness towards students and their families.
- That all efforts continue to be made to ensure appropriate clinical interventions are implemented while at school as this is likely to maximise on the students' wellbeing while they are still able to attend school.
- That a collaborative process of information sharing between CYF, MoE and the New Zealand Fire Service is implemented to ensure that there is active and intensive support (including therapeutic support) over a specified period of time.
- Given that the results in this study highlighted the higher percentage of Stand downs, Suspensions and NETS; it is extremely relevant that schools work more collaboratively and

directly with the families. However this will need to be planned carefully to ensure that the needs of the child and/or young person remains paramount at all times.

### **Summary**

- A brief overview of the results show that the Ministry of Education outcome with the highest percentage of occurrences were for Stand downs, Suspensions and NETS. These are typically due to behavioural issues at school such as non-compliant, disobedient and challenging staff and peers in school. This suggests that school disruption as a result of problematic behaviour is common in this population.
- Truancy is also a regular feature in this sample suggesting that a further exploration of the reasons behind truancy is warranted.
- This also suggests that students who fall into these categories are likely to be on a trajectory towards offending behaviour.

## **What are the differences between male and female firesetters?**

Male children and adolescents engage in firesetting behaviours at far higher rates than their female counterparts (Chen et al., 2003; Dadds & Fraser, 2006; Del Bove et al., 2008; Martin et al., 2004). Consequently, the majority of studies examining this population employ male-only samples, or fail to discriminate between genders, usually due to small numbers of females rendering statistical comparisons impossible. There consequently exists a dearth of knowledge concerning females who engage in firesetting behaviour, and a critical need for research to address this oversight.

The small number of studies that do investigate gender differences have indicated that there are a number of areas in which female and male firesetters may be a distinct group (Dadds & Fraser, 2006; MacKay, Paglia-Boak, Henderson, Marton, & Adlaf, 2009; Martin et al., 2004; Roe-Sepowitz & Hickie, 2011). Although only a very small body of literature considers gender differences in firesetting populations, a central feature of these findings is that firesetting behaviour and its associated factors are characterised by antisocial and delinquent propensity to a greater extent for males than for females. However, antisocial behaviour has also been found to be an important factor for females. It is important to note that similar proportions of females are evident across empirically derived firesetting subtypes (Del Bove & Mackay, 2011) indicating that although emerging literature suggests some gender differences, females are unlikely to represent a unique firesetting subtype with distinct characteristics.

To date, only one study has focussed solely on investigating gender differences among young people who engage in firesetting behaviours (Roe-Sepowitz & Hickie, 2011). Based on their findings, the authors suggested an apparent tendency among males to engage in wider delinquency - a trend that is less evident with female arsonists, for whom firesetting may be described as being more as being 'expressive' in nature, characterised by emotional acting out and stemming from depression, anxiety or suicidal thoughts (e.g., Santtila, Hakkanen, Alison, & Whyte, 2003).

Given the dearth of literature investigating differences between male and female firesetters, the implications that potential differences might have for theoretical understandings of firesetting populations, and intervention practice. A comprehensive understanding of firesetting is in its infancy and if research is able to examine potential gender differences concurrently or within the development of empirically derived firesetting typologies and developmental trajectories, then it is possible to avoid limiting understandings of firesetters to male children and adolescents. Such a broader examination would facilitate the development of intervention approaches appropriate for both males and females.

### **Results**

Figures 1-4 display the results of analyses comparing males and females in the sample on a range of demographic, psychosocial/emotional, behavioural and fire specific factors. Variables labelled with an asterisk were found to be statistically significantly different between gender groups.

### Demographic Information

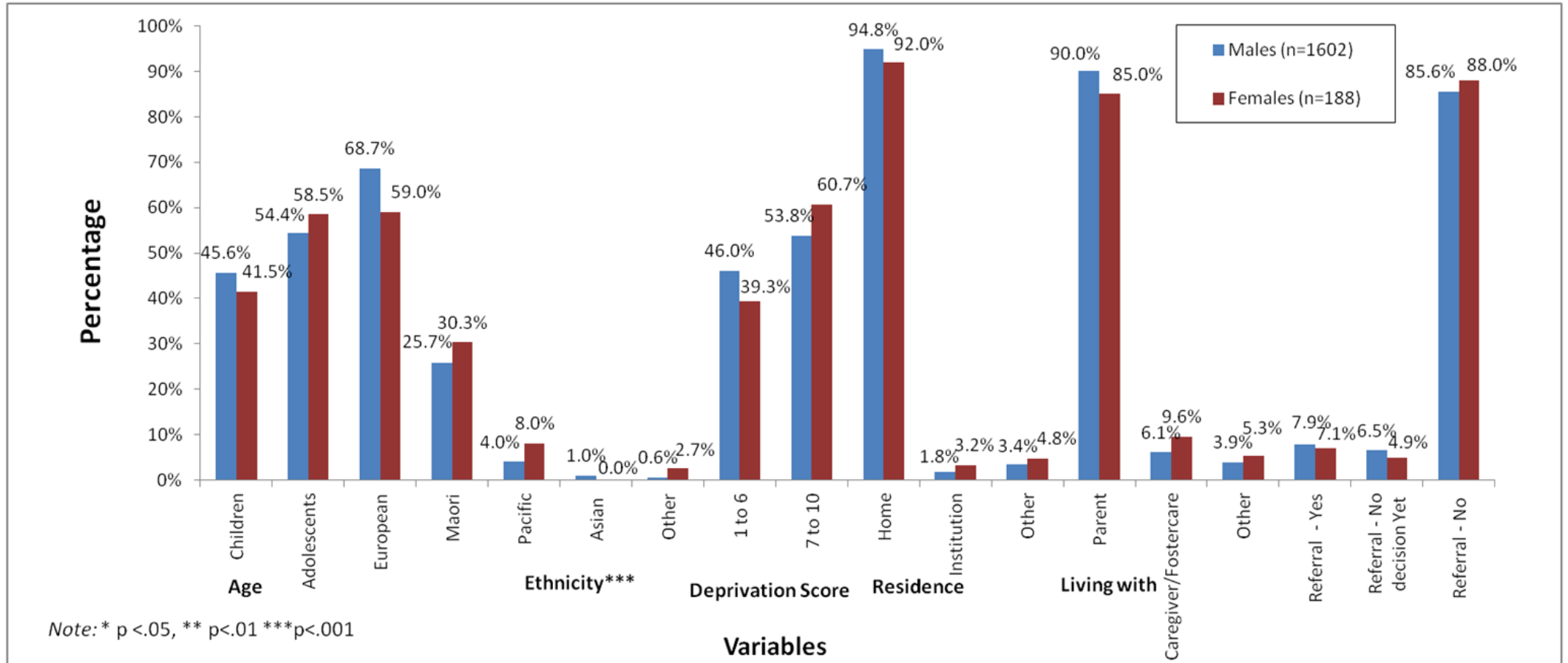


Figure 1. Differences between Males and Females across Demographic Variables

## Psychosocial/Emotional and Environmental Information

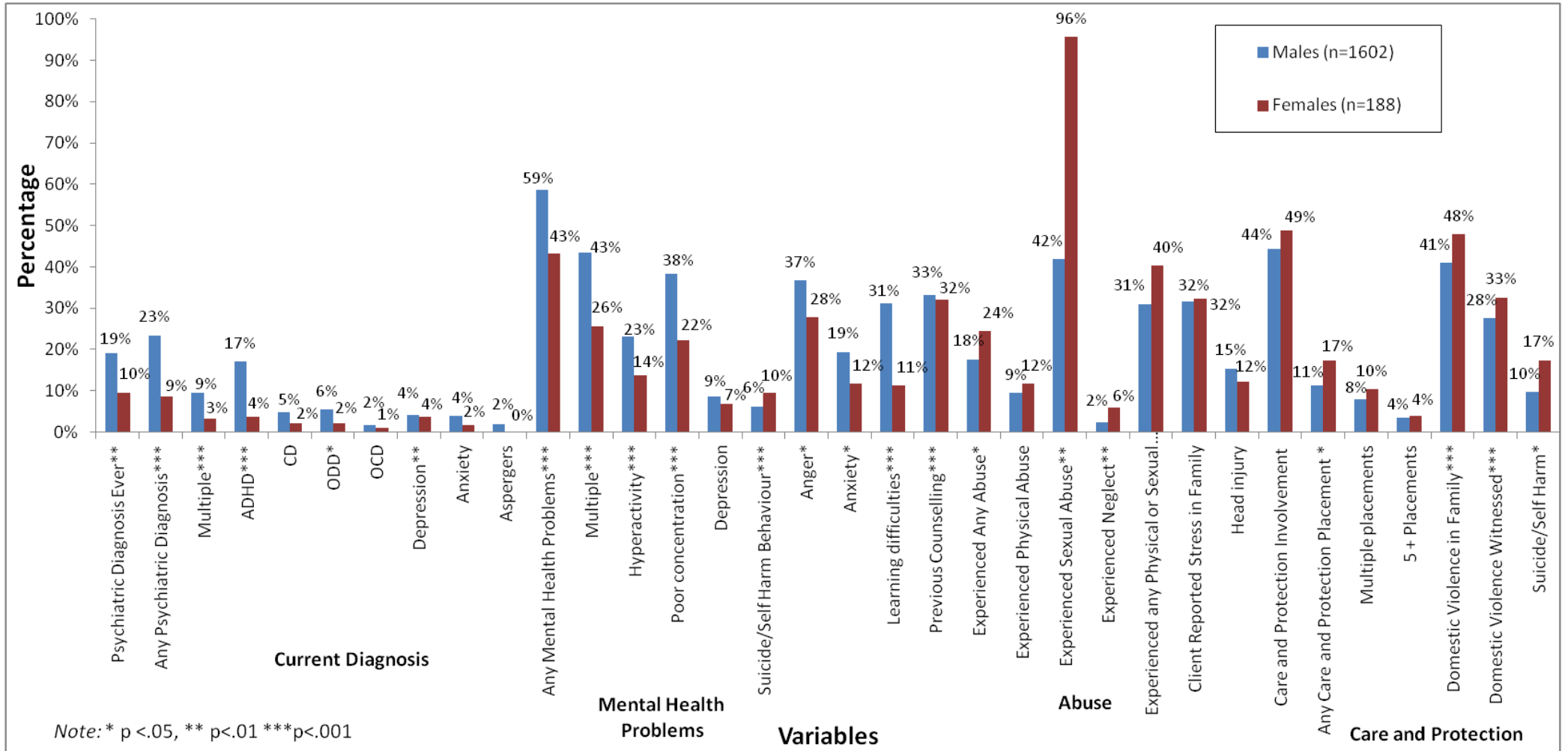


Figure 2. Differences between Males and Females across Psychosocial/Emotional and Environmental Variables

### Conduct and Offending Related Information

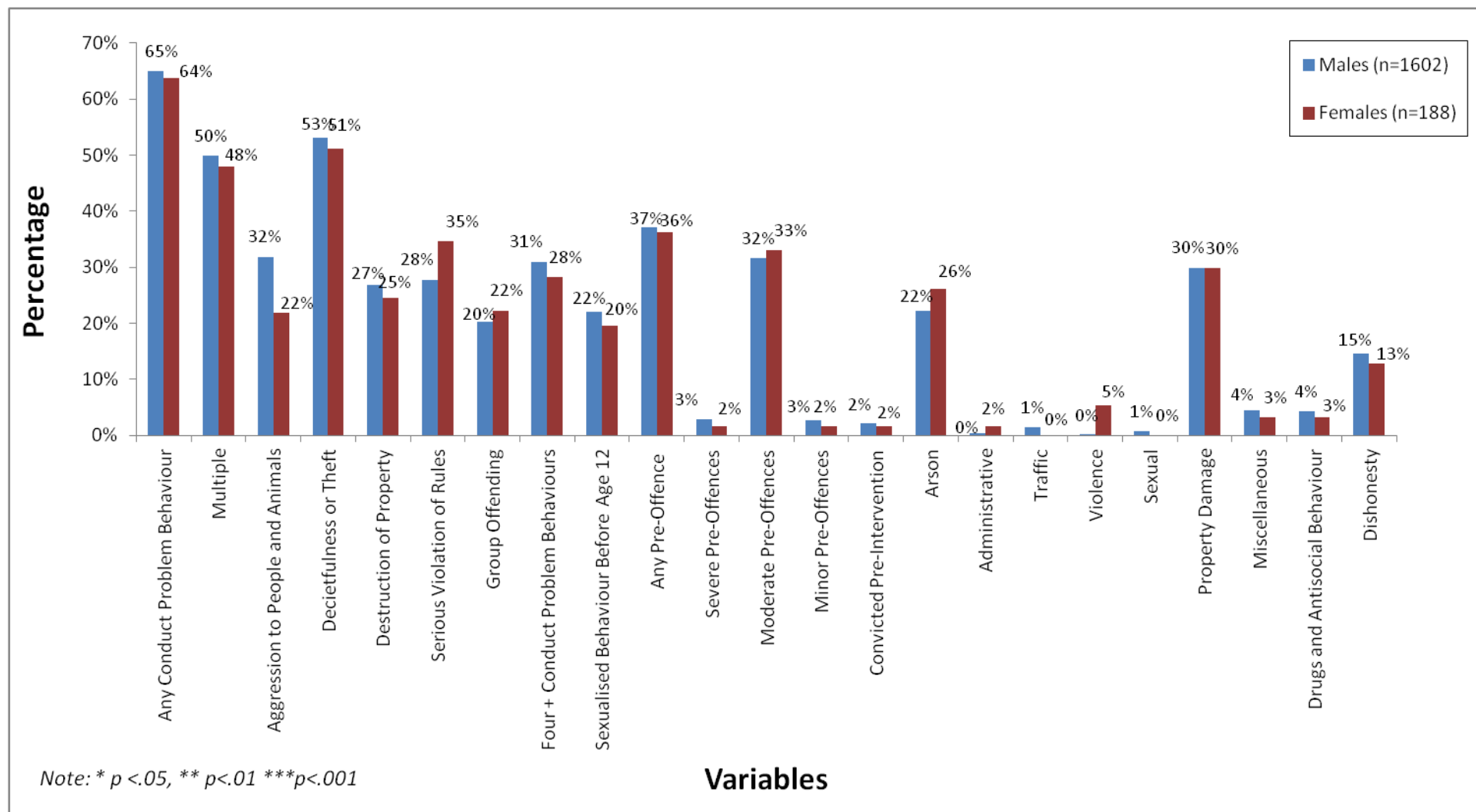


Figure 3. Differences between Males and Females across Conduct and Offending Related Variables

### Fire-Specific Information

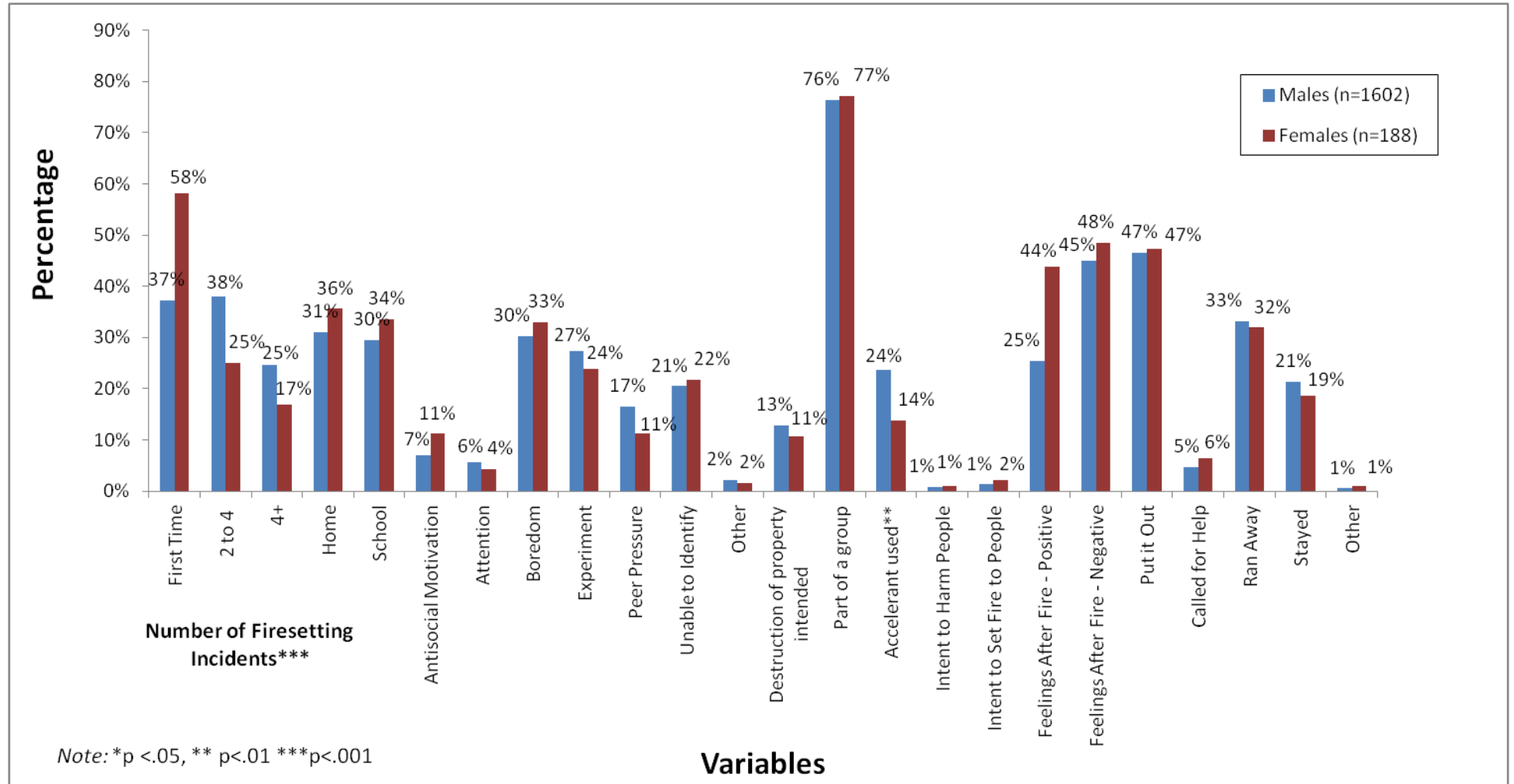


Figure 4. Differences between Males and Females across Fire-Specific Variables

## Discussion

The vast majority of individuals in the sample were male (89.5%), which is very similar to the rates of males in firesetting subgroups in community sample studies (Dadds & Fraser, 2006; Martin et al., 2004). Results of the current study were largely consistent with existing literature, which suggests that males and females in both firesetting and antisocial populations are, for the most part, similar in terms of individual and environmental factors and how these accord risk in relation to their behaviour (Hubbard & Pratt, 2002; Moffitt et al., 2001). However, there are some important differences (Dadds & Fraser, 2006; Martin et al., 2004; Roe-Sepowitz & Hickle, 2011).

Possibly the clearest and most important finding of the current study concerning mental health is that males were significantly more likely to have had a diagnosis of ADHD than their female counterparts (17% versus 3.7%), and were also more likely to have problems with hyperactivity and concentration. ADHD and hyperactivity issues have been frequently recognised as being commonly comorbid with, and increasing risk for firesetting behaviours in male samples (Dadds & Fraser, 2006; Sakheim & Osborn, 1999, Walsh et al., 2004). ADHD symptoms are a known risk factor for a range of conduct problems (Burke, Waldman, & Lahey, 2010). With the exception of ADHD, males and females had similarly low rates of mental health diagnoses, with ADHD for males being the only diagnosis prevalent in over 6% of the respective samples. It is therefore likely that the significantly greater number of males to have ever had a psychiatric diagnosis is largely accounted for by the higher prevalence of ADHD among males. ADHD has been found to be associated with firesetting behaviour in previous studies using male samples (Kolko & Kazdin, 1991; Sakheim & Osborn, 1999; Walsh et al., 2004), and with firesetting behaviour for male but not female children in a mixed gender study (Dadds & Fraser, 2006).

Males were more likely to report problems with hyperactivity, poor concentration, anger, anxiety and learning. However, it is important to note that significant proportions of both males *and* females reported any (59% and 43%) or multiple (43% and 26%) psychosocial/emotional problems. Higher rates of diagnoses and psychosocial/emotional problems for males are likely to be more reflective of a higher prevalence of ADHD rather than a more severe mental health profile given that one third of both males and females had previously been referred to some form of counselling or formal mental health service, that females had higher rates of abuse victimisation histories, and that among those with care and protection histories a greater proportion of females had records of suicidal or self-harming tendencies.

There were higher rates of sexual abuse victimisation among females than males in this sample, which is also typical of the general population (Fleming et al., 2007). Rates of sexual abuse victimisation (22.8% girls and 14.4% boys) were very similar to rates of unwanted sexual contact found by the Youth2000 study, a nationwide survey of young people aged 12-18 (Fleming, 2007), and may reflect a gender discrepancy common to most populations rather than the significance of abuse victimisation as a risk factor for females. Females were more likely to have histories of care and protection or youth justice residential placements prior to their FAIP intervention, suggestive of an environment characterised by significant family dysfunction and abuse.

A striking finding in the current sample was the level of similarity between genders in rates of behavioural problems, and that antisocial behaviour was very prevalent among both males and females having engaged in four or more problem behaviours. There were no gender differences found in rates



of conduct disorder diagnoses, nor specific conduct problem behaviours, or offending both prior to, and following their FAIP intervention. Males were more likely to have multiple firesetting events prior to their intervention, a younger age at first offence and increased rates of convictions and custody in the post-intervention period suggesting that although male and female firesetters are similar in terms of whether they have engaged in problematic behaviours or not, males have increased severity and frequency of this behaviour particularly as they get older. These findings are consistent with the widely recognised trend for males to be more likely to be antisocial, more severely antisocial and more frequent in their behaviour (Moffitt et al., 2001).

In terms of fire behaviours specifically, males were more likely than females to have been involved in four or more fires prior to the date of intervention, which might be explained by earlier onset and greater severity of conduct problems for males. Females were more likely to have engaged in only a single firesetting episode.

Authors have suggested that converse to firesetting as 'expressive' of emotional and psychological stress for girls (Roe-Sepowitz & Hickie, 2011; Santtila et al., 2003), firesetting for males is part of a wider pattern of delinquency (Roe-Sepowitz & Hickie, 2011). Given the results of this study, which suggest that female firesetters, although perhaps less severe and frequent in their offending, are also engaged in broader patterns of antisocial behaviour, it may be that such a conceptualisation is overly simplistic and may underestimate the significance of wider antisocial behaviour also engaged in by females. Additionally, despite females reporting higher rates of childhood victimisation and suicidal ideation and self-harming tendencies than males, both males and females displayed internalising tendencies, with males having significantly greater levels of anxiety suggesting that the notion of firesetting as 'expressive' for girls may fail to acknowledge internalising the psychological and emotional distress that is also experienced by males

Given the gender differences found in the current study and other emerging literature, it would be imprudent to assume that research concerning male firesetters is directly relevant to females. It is therefore extremely important that this rapidly growing area of research curbs the predisposition towards understandings of firesetters that are limited to the male majority through failure to address gender in study design.

Although research suggests that gender differences are likely to exist in firesetting populations, these are likely subtle and complex. Although an awareness of some potential gender differences is crucial for research efforts and may enhance treatment practice, this research suggests that for the most part, with knowledge currently available, male and female firesetters are both likely to have significant and broad presenting problems. There is not currently evidence of gender differences that would warrant gender specific intervention. Consequently, intervention approaches, rather than being targeted at gender specific needs, need to be individualised and targeted at individual needs and behavioural severity levels.

## Summary

- The vast majority of individuals in the sample were male (89.5%).
- Males were significantly more likely to have had a diagnosis of ADHD than their female counterparts (17% versus 3.7%), and were also more likely to have problems with hyperactivity and concentration.
- Males and females had similar rates of behavioural problems, and that antisocial behaviour was very prevalent among both males and females having engaged in four or more problem behaviours. Males have increased severity and frequency of this behaviour however, particularly as they get older.
- The notion that converse to firesetting as 'expressive' of emotional and psychological stress for girls (Roe-Sepowitz & Hickie, 2011; Santtila et al., 2003), firesetting for males is part of a wider pattern of delinquency (Roe-Sepowitz & Hickie, 2011) is likely to be limiting in understanding gender differences in firesetting behaviour.
- Although gender differences are likely to be complex and subtle, it would be imprudent to assume that research concerning male firesetters is directly relevant to females.

## **What are the differences between children and adolescents who set fires?**

Although much empirical investigation of firesetting samples tends to investigate either child or adolescent samples, there is a significant lack of literature investigating what the differences between these two populations might be and the implications for delivering age appropriate treatment. It is often assumed that due to developmental differences, firesetting among adolescents tends to be more severe and antisocially motivated than that of their child counterparts. Findings from a community sample of children found a relationship between age and rates of firesetting, with fire interest and match and fire play increasing with age (Dadds & Fraser, 2006), suggesting that a continuum of age may be more appropriate than two distinct groups. Additionally, children have been found to be equally as prevalent as adolescents in groups defined by behavioural severity, and to be equally as likely to engage in recidivism, indicating that the notion of children as less high risk than their adolescent counterparts may be somewhat misguided (Del Bove, 2005).

The current body of literature lacks specific comparisons of the two age groups in terms of firesetting and therefore, at the present time, the extent to which they may or may not be considered distinct groups remains unclear. The current study extends the existing research in this area by comparing children and adolescents on a broad range of individual, environmental and fire specific variables to investigate how they may or may not differ.

### **Results**

Figures 5-8 display the results of analyses comparing children and adolescents in the sample on a range of demographic, psychosocial/emotional, behavioural and fire specific factors. Variables labelled with an asterisk were found to be statistically significantly different between age groups.

## Demographic Information

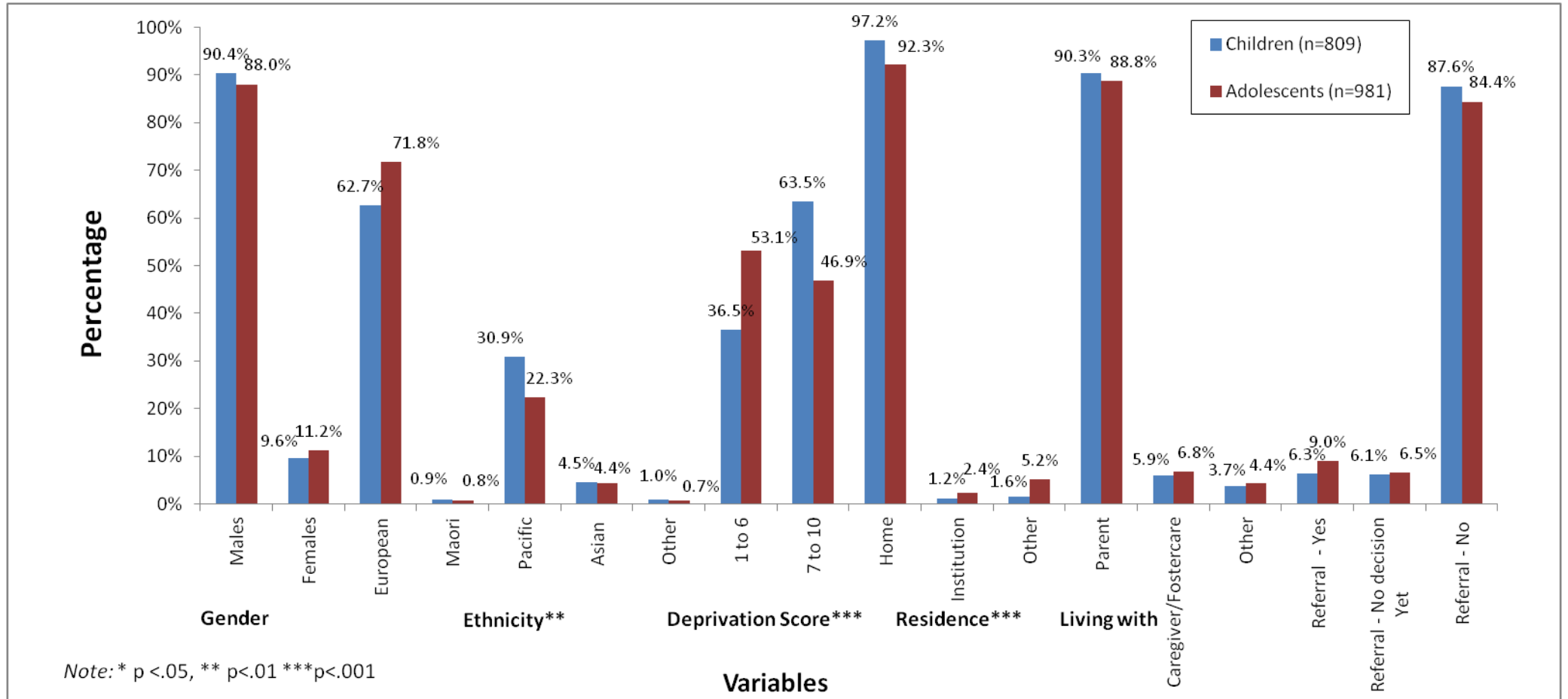


Figure 5. Differences between Children and Adolescents across Demographic Variables

## Psychosocial/Emotional and Environmental Information

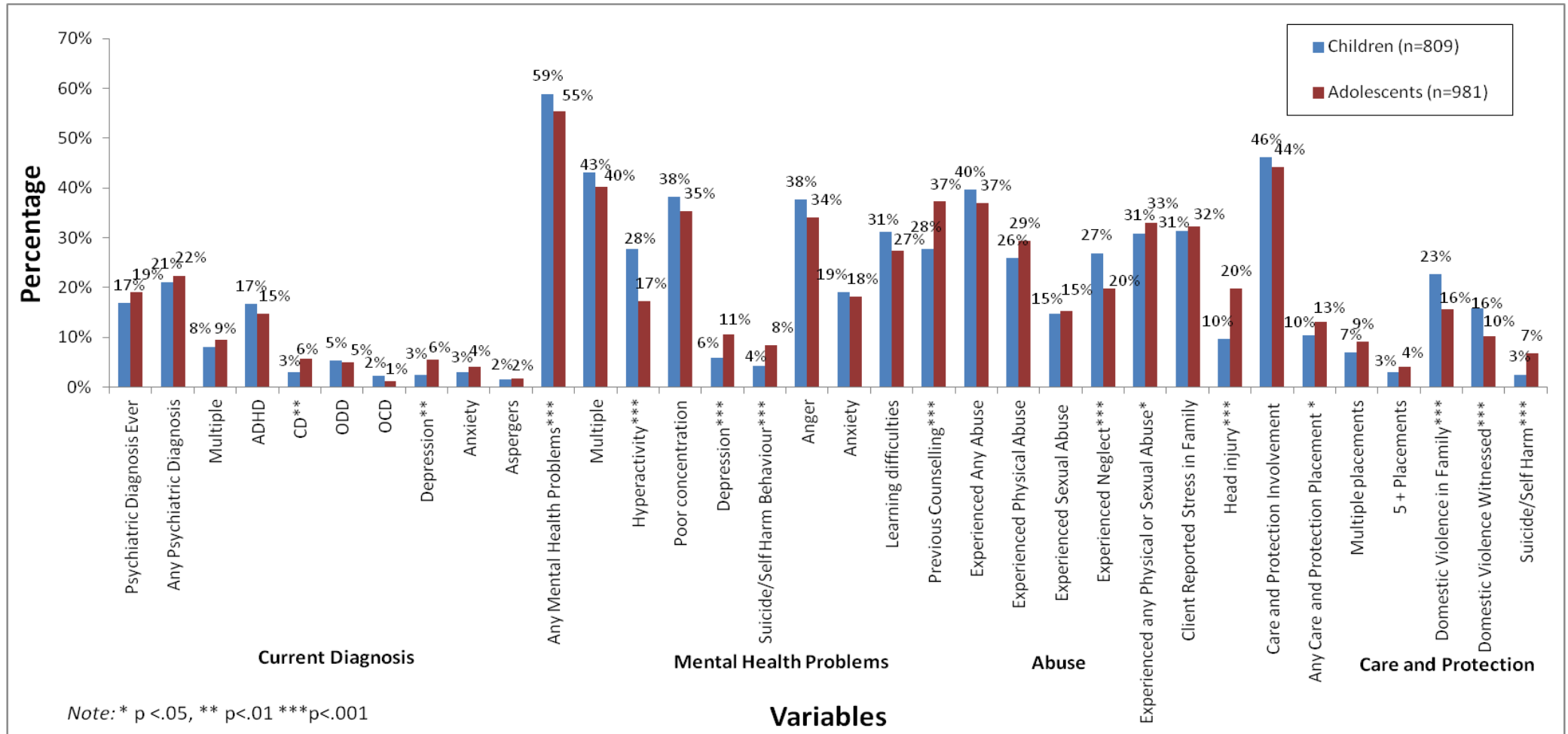


Figure 6. Differences between Children and Adolescents across Psychosocial/Emotional and Environmental Variables

### Conduct and Offending Related Information

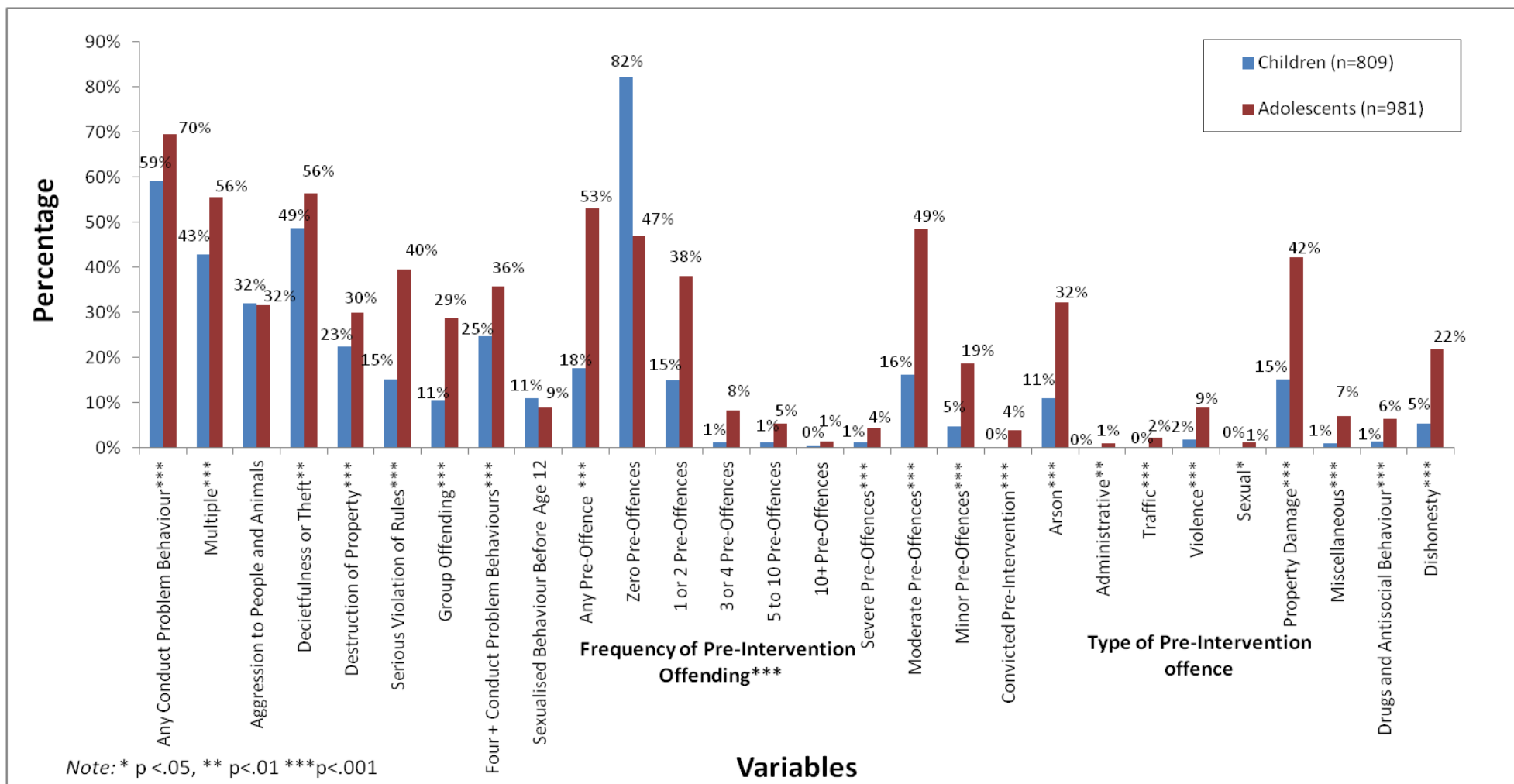


Figure 7. Differences between Children and Adolescents General Offending across Conduct and Offending Related Variables

## Fire-Specific Information

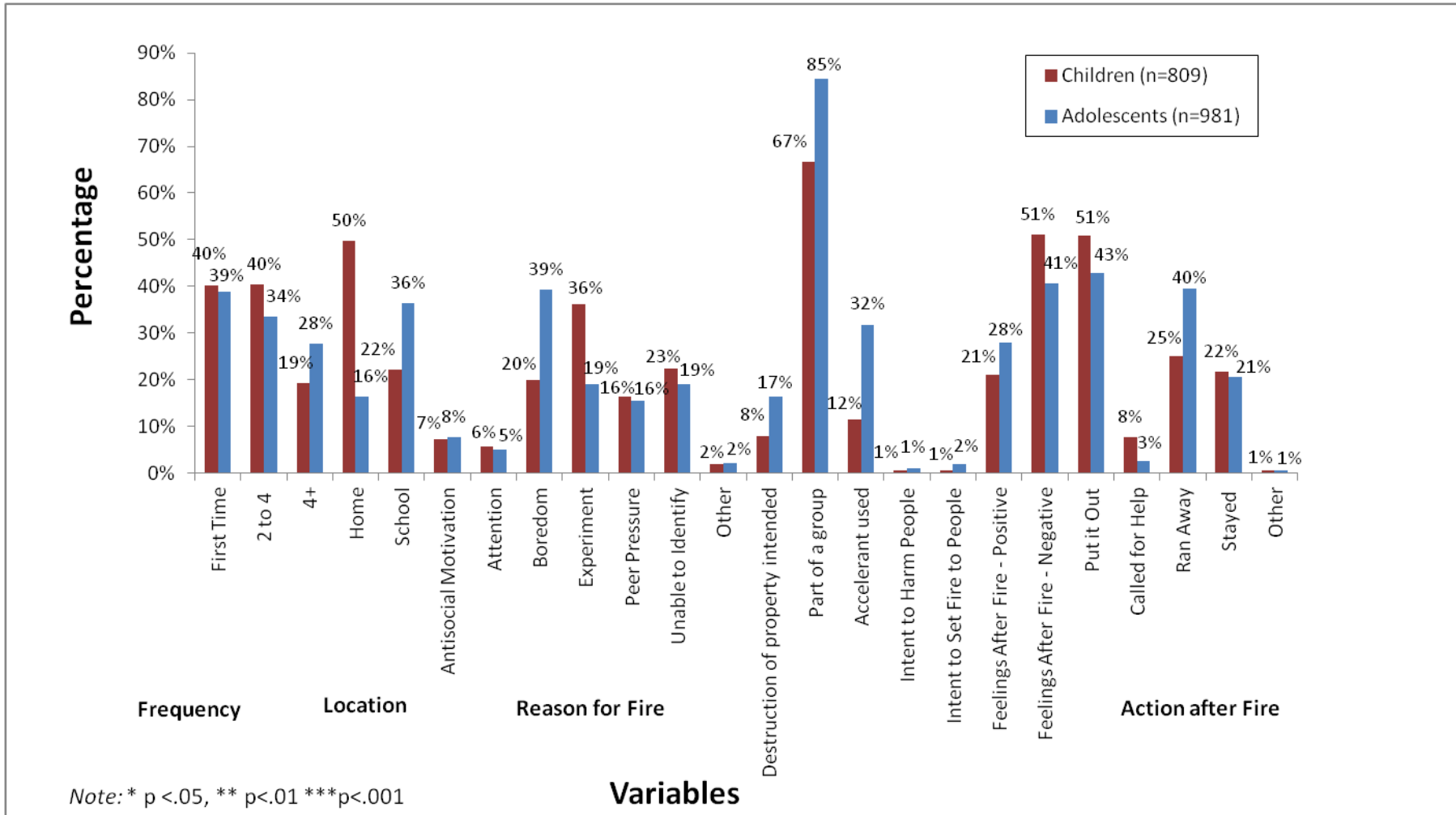


Figure 8. Differences between Children and Adolescents across Fire-Specific Variables

## Discussion

The above findings suggest a number of differences between children and adolescents in a firesetting population. Several group differences that were apparent were unsurprising given developmental expectations. Additionally, in the case of many historical factors, older age reflects greater opportunity for adverse experience, or development of behaviour.

It is unsurprising that adolescents were significantly more likely to have had previous referral to counselling or formal mental health service given the greater provision of free counselling in high school setting, the greater ability for autonomous help seeking by adolescents and the numerous life transitions that adolescents experience which may compound existing predispositions or psychosocial difficulties. Notably however, children and adolescents were equally likely to have a psychiatric diagnosis, and all diagnoses were equally as prevalent for children and adolescents with the exception of conduct disorder and depression diagnoses, which were more prevalent in adolescents. This suggests that mental health problems may emerge early in this population. Although there was no age group difference in ADHD diagnoses, hyperactivity was significantly more prevalent in children than adolescents, which is not surprising as this is when these diagnoses are first given (Burke, et al., 2010).

Although physical and sexual abuse histories were equally prevalent among children and adolescents, neglect was significantly more prevalent among children. However, it is notable that increased reporting of neglect for children is likely to be due to the fact that neglect is more likely to be identified and reported when a child is young due to their high level of need as a result of their age. Interestingly, children and adolescents had similar histories of care and protection contact and out of home placements, suggesting that high level of needs were identified regardless of the child's age and that firesetting populations are exposed to family dysfunction from a young age

Taken together, these findings suggest that family dysfunction, victimisation and psychosocial/emotional problems emerge early in this population and suggests that many of these children grow up in families in less than ideal circumstances.

Adolescents were more likely to engage in any of the listed conduct problem behaviours, and to have engaged in four or more conduct problem. This may reflect some level of low level normative conduct problem behaviour in adolescence, but also that such behaviours are less likely to occur in children. Therefore, those children who do exhibit these behaviours typically constitute a smaller group who have more severe and problematic behaviours. The majority of conduct problem behaviours assessed by the FAIP questionnaire were more prevalent among adolescents. There were no age group differences in aggression toward people and/or animals. Adolescents were more likely to have a police record of offending, to have offended at all severity levels, to have had a conviction and to have committed all offence types prior to their contact with the FAIP. This is expected given that adolescents offend more frequently than children and that any offending would be more serious and more likely to come to the attention of the police thus resulting in an official record (Lambie, Ioane, Randell & Seymour, 2013).



Unsurprisingly, given developmental norms, children were more likely to set a fire at home, and adolescents to set a fire in a school setting. Motivations for firesetting were very similar between the groups with the exception of boredom which was more prevalent in adolescents and experimentation which was more prevalent among children. This finding would be expected as developmentally, children are more likely to engage in firesetting due to wanting to experiment, as opposed to adolescents who know and understand about fire, yet are motivated by more psychological factors such as boredom. Only adolescents in the sample set the referral fire in an attempt to conceal a crime, however it must be noted that this was only eleven individuals total. A significantly greater proportion of adolescents than children intended to destroy property with their firesetting behaviour, used an accelerant, and set fire in the context of group behaviour. This again reflects the increased level of risk taking and antisociality that adolescents engage in and the importance of peer group influenced behaviour during this developmental period. Children were more likely than adolescents to have negative feelings in relation to their firesetting behaviour, and adolescents were more likely than children to have positive feelings. It is notable however that reports of negative feeling were more prevalent than positive feelings for both age group.

Similar proportions of children and adolescents were first time firesetters, a greater proportion of children than adolescents had set 2-4 fires and a greater proportion of adolescents than children had set more than 4 fires. As previously discussed, such a finding is not surprising given that adolescents have been found to offend more seriously and to engage in more risk taking behaviours than children (Lambie, et al., 2013).

The above findings reflect the literature on children and adolescents with conduct problems. Namely that when compared to child offenders, adolescents offend more seriously, they are more likely to offend in groups, and overall they display more antisocial traits than child offenders. This finding is not only reflected in the way in which they deliberately light fires, but also in their general offending behaviour.

### **Summary**

- Findings reflect the literature on children and adolescents with conduct problems. Namely that when compared to child offenders, adolescents offend more seriously, they are more likely to offend in groups, and overall they display more antisocial traits than child offenders.
- Many differences between age groups would be expected given normative development.

## **Antisocial Behaviour and Firesetting**

Because for at least a subgroup of intentional firesetters, firesetting occurs alongside a number of other antisocial behaviours, it is increasingly being conceptualised within the context of antisocial behaviour. Firesetting is a diagnostic criterion of conduct disorder (CD) (American Psychiatric Association [DSM-IV-TR], 2000), and many risk factors for firesetting behaviour are common to conduct problem behaviour (see Murray & Farrington, 2010 for a review). Fifty-six percent of firesetters drawn from a community sample were also classified as having serious antisocial behaviour; and 40% of those with serious antisocial behaviour were also firesetters, indicating a significant level of comorbidity (Martin et al., 2004). Firesetters exhibit conduct and externalising behaviour problems to a greater extent than their non-firesetting counterparts (Dadds & Fraser, 2006; Kolko & Kazdin, 1991b; Martin et al., 2004; Sakheim and Osborn, 1999) and serious antisocial behaviour has been found to be the best predictor of self-reported firesetting (Martin et al., 2004). Many firesetters fall within the clinical range of externalising behaviour (MacKay et al., 2006), and many go on to commit general offences throughout adolescence and early adulthood (Lambie, et al., 2013). The notion that firesetting may be best understood within the context of antisocial behaviour is particularly supported by research which indicates that when antisocial firesetters and non firesetters are compared, few differences are found between the groups (Forehand, Wierson, Frame, Kemptom & Armistead, 1991; Martin et al., 2004), and that the structure and pattern of antisocial behaviour of the groups does not differ (Stickle & Blechman, 2002).

A small but significant number of studies indicate that firesetting may be a marker of particularly severe antisociality. Within a sample of offenders, firesetting is associated with early onset and severity of antisocial behaviour (Stickle & Blechman, 2002), and after accounting for antisocial behaviour, *extreme* antisocial behaviour is associated with firesetting for both boys and girls (Martin et al., 2004). Firesetting predicts both violent and non-violent later delinquency, and child firesetters were three times more likely to be referred to juvenile court in adolescence, even after controlling for CD (Becker, Stuewig, Herrera, & McCloskey, 2004). Such studies are indicative of the potential seriousness of the increased risk for, and extreme nature of, antisocial behaviour exhibited by firesetters.

Due to the fact that existing literature suggests that firesetting is best understood as an antisocial behaviour, it is possible that models used of conduct problem behaviour and the much greater body of research that informs such models, may be drawn on to contribute to understandings of firesetting (see Dodge & Pettit, 2003; Frick, 2012; Moffit, 1993). However, such a conceptualisation is limited for a number of reasons. Firstly, Kolko and Kazdin (1991b) found no interaction effect between firesetting status and conduct disorder, indicating the presence of a conduct disorder diagnosis was not sufficient to explain differences between firesetters and non-firesetters. This is likely to reflect the variation within and highlights the highlights such an understanding of firesetting as being applicable only to those who exhibit a range of antisocial behaviours and unlikely able to account for the extensive variability in the presence and levels of antisociality in firesetting populations.

Additionally, even in antisocial populations, the presence of fire-specific risk factors and other pathology not associated with the behaviour of non firesetting antisocial individuals may distinguish the aetiology

of firesetting from that of conduct disorder. Although purely theoretical, Fineman (1995) suggests that 'lack of early parental supervision relative to fire interest or fire play, a lack of previous training in fire safety, a history of previous firesetting and the appropriateness of a parent or significant other's response to a fire' may be risk factors for maladaptive fire use specifically, while other factors increase risk for maladaptive behaviour generally. Within an antisocial population, after controlling for antisocial behaviour, fire interest has been found to be a predictor of both firesetting status and firesetting recidivism (MacKay et al., 2006). However, notably, non-fire-specific factors have also been found to be associated with firesetting even after accounting for antisocial behaviour. Such factors include *extreme* antisocial behaviour, serious and extreme drug use, suicide plans and attempts and experience of sexual abuse for boys, and extreme antisocial behaviour, perception of academic failure and feelings of hopelessness for girls (Martin et al., 2004). However there is currently a dearth of literature that considers risk factors specific to firesetters, the role of fire specific risk factors such as fire interest and how such factors may interact with more general risk factors for antisocial behaviour.

## Results

### ***Post-Intervention General Offending Univariable and Multivariable Analyses***

#### ***Univariable analyses of factors associated with post-FAIP intervention offending***

Post-FAIP intervention general offending was seen among 1105 of the sample (61.7%). Tables 7 to 10 display the univariable analyses for any general offence post-FAIP intervention across demographic, psychosocial/emotional, conduct problems, and fire specific variables. As shown in Table 7, for example, those aged up to 11 years were significantly less likely to have a general offence post-intervention (45.5%) than those aged 12 years and older (75.1%;  $OR = 0.28, p < .0001$ ).

As expected, the vast majority of measures concerning victimisation, conduct problem behaviour and Care and Protection history were highly associated with offending. Specifically, the factors associated with offending included the presence of a history of abuse, having a mental health diagnoses of either CD, ODD, and/or ADHD, a broad range of psychosocial problems (i.e., poor concentration, depression, self-harm, anger, anxiety), the presence of the vast majority of measured conduct problem behaviours (with the exception of those that were very infrequent in the sample), the presence of four or more behaviour problems, a history of early inappropriate and concerning sexualised behaviours, offending prior to contact with the FAIP intervention, having a Care and Protection history, having a residential placement history, as well as the domestic violence being present in the family environment and witnessed by the child or adolescent. Interestingly, having a mental health diagnosis of OCD, Depression, Anxiety, Asperger's spectrum disorder, and problems with hyperactivity and learning were not associated with later offending.

Motivations for firesetting were not associated with offending with the exception of boredom and experimentation. A larger proportion of those whose firesetting was related to boredom offended following intervention than those whose firesetting was not motivated by boredom. Those whose

firesetting was reported to be due to experimenting were less likely to offend than those whose were not. This is most likely due to the fact that more children reported lighting fires due to experimentation and as such children have been shown to offend less seriously than adolescents. In part this is due to the fact that adolescents are more likely to take greater risks but also that children are more closely supervised by their parents.

Not setting a fire at home and setting a fire at school were both associated with later offending. Intending to destroy property by lighting a fire, firesetting in a group and use of an accelerant, and intent to harm people through setting fire to property were all related to later offending. This likely reflects the presence of antisocial attitudes and an antisocial peer group which are highly correlated with antisocial behaviour.

### ***Multivariable modelling for future post-FAIP intervention offending***

Table 11 and Figure 9 show the results of the multivariable model building for the predictor model of offending post-FAIP intervention. As shown in Table 11, the final multivariable predictor model had five variables: previous offending, older age group, whether the fire was set at home, four or more conduct problem behaviours, and prior involvement with CYF. The five predictor model accounted for 16.9% of the variance for offending post-intervention. The area under the ROC curve (AUC) for offending post-FAIP intervention was fair, with 0.770 for offending.

This model fits well within the existing body of literature concerning conduct problem behaviour and offending and suggests that firesetting likely fits well within this framework in many ways. The five variables that were shown to be associated with offending independent of all other variables were, for the most part, those that are known to be highly associated with offending behaviours. Past antisocial behaviour is known to predict future antisocial behaviour and it is therefore unsurprising that both offending, as well as the presence of four or more conduct problem behaviours prior to FAIP contact were associated with offending behaviour in the follow up period after intervention. Being an adolescent at the time of intervention was also associated with post intervention offending which is unsurprising given that antisocial behaviours tend to develop with older age throughout childhood and adolescents, particularly with the transition into adolescence and the increased wish for autonomy and peer group influence that this developmental period entails. Prior contact with CYF likely encompasses a range of known risk factors for offending including family dysfunction, experience of victimisation and witnessing domestic violence. The association between setting fire away from home and later offending is a somewhat novel finding but again likely reflects a multitude of risk factors such as older age and lack of supervision and parental monitoring.

Table 7

*Frequencies, Percentages, Odds Ratios (OR), and Chi Squared Statistics of Demographics, Assessment and Intervention Predictors of Any General Offence Post-Intervention*

Variable	Any General Offence						
	Yes		No	OR	$\chi^2$	p-value	R <sup>2</sup>
	n	% <sup>†</sup>	N				
<b>Age at referral</b>							
Up to 11 years	368	45.5	441	0.28	164.87***	<.0001	0.0699
12 years and older	737	75.1	244				
<b>Gender</b>							
Male	1001	62.5	601	1.35	3.66	0.06	0.0015
Female	104	55.3	84				
<b>Ethnicity</b>							
European	726	61.0	465		9.09	0.06	0.0038
Asian	5	33.3	10				
Maori	300	65.1	161				
Pacific	49	62.8	29				
Other	7	46.7	8				
<b>Deprivation Score</b>							
1 to 6	471	60.3	310	0.90	1.18	0.28	0.0005
7 to 10	589	62.9	348				
<b>Referred on to another agency</b>							
Yes	93	67.9	44		3.44	0.18	0.0015
No decision made yet	73	65.8	38				
No	916	60.9	589				
<b>Current Residence</b>							
Home	1027	60.8	663		14.49***	0.0007	0.007
Institution	30	88.2	4				
Other	47	73.4	17				
<b>Who client lives with</b>							
Parents	973	60.8	628		6.83*	0.03	0.003
Caregiver or Foster	83	72.2	32				
Other	49	67.1	24				

Note: <sup>†</sup>The percentage represents the percentage of subjects who exhibited that characteristic

\* p <.05, \*\* p<.01 \*\*\*p<.001

Table 8

*Frequencies, Percentages, Odds Ratios (OR), and Chi Squared Statistics of Psychosocial/Emotional and Environmental Predictors of Any General Offence Post-Intervention*

Variable	Any General Offence						
	Yes		No		$\chi^2$	<i>p</i> -value	<i>R</i> <sup>2</sup>
	<i>n</i>	% <sup>+</sup>	<i>N</i>	<i>OR</i>			
<b>Ever been given a psychiatric diagnosis</b>							
Yes	227	70.3	96	1.59	12.19***	0.0005	0.0053
No	878	59.9	589				
<b>Any current psychiatric diagnosis</b>							
Yes	272	69.7	118	1.56	13.22***	0.0003	0.0057
No	833	59.6	564				
<b>Multiple current psychiatric diagnoses</b>							
One	162	69.5	71		13.23***	0.001	0.0057
Multiple	110	70.1	47				
No	833	59.6	564				
<b>Attention Deficit Hyperactivity Disorder Diagnosis</b>							
Yes	201	72.0	78	1.72	14.60***	0.0001	0.0064
No	904	59.9	604				
<b>Conduct Disorder Diagnosis</b>							
Yes	60	75.0	20	1.90	6.15**	0.01	0.0027
No	1045	61.2	662				
<b>Oppositional Defiant Disorder Diagnosis</b>							
Yes	70	76.1	22	2.03	8.35**	0.004	0.0037
No	1035	61.1	660				
<b>Obsessive Compulsive Disorder Diagnosis</b>							
Yes	20	69.0	9	1.38	0.64	0.43	0.0003
No	1085	61.7	673				
<b>Depression Diagnosis</b>							
Yes	45	60.8	29	0.96	0.03	0.85	0
No	1060	61.9	653				
<b>Anxiety Diagnosis</b>							
Yes	42	65.6	22	1.19	0.40	0.53	0.0002
No	1063	61.7	660				
<b>Aspergers Diagnosis</b>							
Yes	16	53.3	14	0.70	0.94	0.33	0.0004
No	1089	62.0	668				
<b>Any Mental Health Problems</b>							
Yes	669	65.7	350	1.46	15.14***	<.0001	0.0063
No	436	56.6	334				
<b>Multiple Mental Health Problems</b>							
One	171	62.0	105		17.33***	0.0002	0.0073

Multiple	498	67.0	245				
No	436	56.6	334				
<b>Hyperactivity</b>							
Yes	252	64.0	142	1.13	1.03	0.31	0.0004
No	853	61.1	542				
<b>Poor concentration</b>							
Yes	440	67.2	215	1.44	12.80***	0.0003	0.0054
No	665	58.6	469				
<b>Depression</b>							
Yes	108	72.0	42	1.66	7.26***	0.007	0.0032
No	997	60.8	642				
<b>Self harm</b>							
Yes	83	70.9	34	1.55	4.46*	0.03	0.0019
No	1022	61.1	650				
<b>Anger</b>							
Yes	436	68.1	204	1.53	17.06***	<.0001	0.0073
No	669	58.2	480				
<b>Anxiety</b>							
Yes	223	67.0	110	1.32	4.69*	0.03	0.002
No	882	60.6	574				
<b>Learning problems</b>							
Yes	337	64.8	183	1.20	2.87	0.09	0.0012
No	768	60.5	501				
<b>Previously referred to counselling/formal mental health service</b>							
Yes	414	70.2	176	1.72	25.92***	<.0001	0.0111
No	691	57.7	506				
<b>Currently under referral to another agency</b>							
Yes	430	71.7	170	1.93	37.87***	<.0001	0.0163
No	674	56.7	515				
<b>Any Experienced Abuse</b>							
Yes	487	71.8	191	2.00	44.25***	<.0001	0.0192
No	615	56.1	482				
<b>Physical Abuse</b>							
Yes	365	73.9	129	2.09	40.65***	<.0001	0.0179
No	736	57.5	544				
<b>Sexual Abuse</b>							
Yes	196	73.4	71	1.84	17.25***	<.0001	0.0076
No	904	60.0	602				
<b>Neglect</b>							
Yes	294	72.4	112	1.83	24.15***	<.0001	0.0106
No	805	58.9	561				
<b>Any Physical and/or Sexual Abuse</b>							
Yes	415	73.1	153	2.05	42.77***	<.0001	0.0187

No	687	56.9	520				
<b>Client report stress in the family</b>							
Yes	364	64.8	198	1.21	3.35	0.07	0.0014
No	733	60.2	484				
<b>Client suffered from a head injury</b>							
Yes	205	75.9	65	2.17	26.87***	<.0001	0.012
No	894	59.3	614				
<b>Involvement with CYF</b>							
Yes	570	71.2	231	2.07	52.40***	<.0001	0.0225
No	531	54.4	445				
<b>Any Placement</b>							
Yes	167	79.5	43	2.64	31.39***	<.0001	0.0144
No	931	59.5	633				
<b>Multiple Placements</b>							
Yes	111	77.1	33	2.19	15.33***	<.0001	0.007
No	987	60.6	643				
<b>5 or more placements</b>							
Yes	50	79.4	13	2.43	8.45**	0.004	0.0039
No	1048	61.3	663				
<b>Domestic violence present</b>							
Yes	249	74.6	85	2.04	27.95***	<.0001	0.0124
No	849	59.0	591				
<b>Domestic violence witnessed by client</b>							
Yes	172	76.4	53	2.18	23.13***	<.0001	0.0104
No	926	59.8	623				
<b>Suicide or self-harm indications</b>							
Yes	69	81.2	16	2.77	14.07***	0.0002	0.0066
No	1029	60.9	660				

Note: †The percentage represents the percentage of subjects who exhibited that characteristic

\* p <.05, \*\* p<.01 \*\*\*p<.001



Table 9

*Frequencies, Percentages, Odds Ratios (OR), and Chi Squared Statistics of Conduct Problems and Offending Related Predictors of Any General Offence Post-Intervention*

Variable	Any General Offence			OR	$\chi^2$	p-value	R <sup>2</sup>
	Yes		No				
	n	% <sup>+</sup>	N				
<b>Any Conduct Problem Behaviour</b>							
Yes	798	68.7	363	2.31	68.57***	<.0001	0.0285
No	307	48.8	322				
<b>Multiple Conduct Problem Behaviours</b>							
One	149	55.0	122		96.87***	<.0001	0.0411
Multiple	649	72.9	241				
None	307	48.8	322				
<b>Aggression to People and Animals</b>							
Yes	406	71.5	162	1.88	33.46***	<.0001	0.014
No	699	57.2	523				
<b>Deceitfulness or Theft</b>							
Yes	655	69.2	291	1.97	47.86***	<.0001	0.020
No	450	53.3	394				
<b>Destruction of Property</b>							
Yes	357	75.2	118	2.29	49.34***	<.0001	0.022
No	748	56.9	567				
<b>Serious Violation of Rules</b>							
Yes	398	77.9	113	2.85	79.01***	<.0001	0.035
No	707	55.3	572				
<b>Group offending</b>							
Yes	297	81.1	69	3.28	73.42***	<.0001	0.0334
No	808	56.7	616				
<b>Four or more conduct problem behaviours</b>							
Yes	424	77.1	126	2.76	79.28***	<.0001	3.47
No	681	54.9	559				
<b>Sexualized behavior before age 12</b>							
Yes	139	79.9	35	2.65	26.48***	<.0001	0.0122
No	959	59.9	641				
<b>Any previous offences</b>							
Yes	552	83.1	112	5.11	204.64***	<.0001	0.0918
No	553	49.1	573				
<b>Previous Offence Count</b>							
Zero	553	49.1	573		219.12***	<.0001	0.11
1 or 2	391	79.0	104				
3 or 4	85	93.4	6				
5 to 10	59	96.7	2				
10+	17	100.0	0				

<b>Any serious previous offence</b>							
Yes	46	92.0	4	7.40	19.95***	<.0001	0.0104
No	1059	60.9	681				
<b>Any moderate previous offence</b>							
Yes	502	82.8	104	4.65	172.77***	<.0001	0.0778
No	603	50.9	581				
<b>Any minor previous offence</b>							
Yes	202	91.0	20	7.44	91.84***	<.0001	0.0462
No	903	57.6	665				
<b>Conviction for previous offence</b>							
Yes	37	97.4	1	23.70	20.87***	<.0001	0.0121
No	1068	61.0	684				
<b>Previous offence - Arson</b>							
Yes	328	80.8	78	3.29	80.72***	<.0001	0.0365
No	777	56.1	607				
<b>Previous offence - Administrative</b>							
Yes	9	100.0	0		5.61*	0.02	0.0037
No	1096	61.5	685				
<b>Previous offence - Traffic</b>							
Yes	22	95.7	1	13.89	11.35***	0.0008	0.0063
No	1083	61.3	684				
<b>Previous offence - Violence</b>							
Yes	93	92.1	8	7.78	41.73***	<.0001	0.0216
No	1012	59.9	677				
<b>Previous offence - Sexual</b>							
Yes	12	100.0	0		7.49**	0.006	0.0049
No	1093	61.5	685				
<b>Previous offence – Property damage</b>							
Yes	440	82.1	96	4.06	134.22***	<.0001	0.0606
No	665	53.0	589				
<b>Previous offence - Miscellaneous</b>							
Yes	66	86.8	10	4.29	21.18***	<.0001	0.0103
No	1039	60.6	675				
<b>Previous offence – Drugs and antisocial behaviour</b>							
Yes	72	98.6	1	47.67	43.86***	<.0001	0.0263
No	1033	60.2	684				
<b>Previous offence - Dishonesty</b>							
Yes	235	91.4	22	8.14	112.11***	<.0001	0.0565
No	870	56.8	663				

Note: †The percentage represents the percentage of subjects who exhibited that characteristic

\* p <.05, \*\* p<.01 \*\*\*p<.001

Table 10

*Frequencies, Percentages, Odds Ratios (OR), and Chi Squared Statistics of Fire Specific Predictors of Any General Offence Post-Intervention*

Variable	Any General Offence							
	Yes		No		OR	$\chi^2$	p-value	R <sup>2</sup>
	n	% <sup>+</sup>	n					
<b>How many times has client used fire inappropriately</b>								
First time	403	59.7	272		12.44**	0.002	0.0056	
2 to 4 times	373	59.6	253					
More than 4 times	283	69.4	125					
<b>Location of referral fire incident - Home</b>								
Yes	229	40.6	335	0.27	155.62***	<.0001	0.0645	
No	876	71.5	350					
<b>Location of referral fire incident - School</b>								
Yes	375	70.0	161	1.67	21.94***	<.0001	0.0094	
No	730	58.2	524					
<b>Motivation – Antisocial</b>								
Yes	88	65.7	46	1.20	0.95	0.33	0.0004	
No	1017	61.4	639					
<b>Motivation – Attention</b>								
Yes	53	54.6	44	0.73	2.21	0.14	0.0009	
No	1052	62.2	640					
<b>Motivation – Boredom</b>								
Yes	382	69.8	165	1.66	21.72***	<.0001	0.0093	
No	723	58.2	519					
<b>Motivation – Experiment</b>								
Yes	233	48.3	249	0.47	50.36***	<.0001	0.0208	
No	872	66.7	435					
<b>Motivation – Peer Pressure</b>								
Yes	183	64.2	102	1.13	0.86	0.35	0.0004	
No	922	61.3	582					
<b>Motivation – Unable to identify a reason</b>								
Yes	234	63.4	135	1.09	0.54	0.46	0.0002	
No	871	61.3	549					
<b>Motivation – Other</b>								
Yes	29	76.3	9	2.02	3.48	0.06	0.0016	
No	1076	61.5	675					
<b>Destruction of property intended</b>								
Yes	178	78.4	49	2.49	30.63***	<.0001	0.0138	
No	927	59.3	636					
<b>Client part of a group at the time of fire</b>								
Yes	896	65.5	472	1.93	34.82***	<.0001	0.0143	
No	209	49.5	213					

<b>Was there an accelerant used</b>							
Yes	281	69.2	125	1.53	12.51***	0.0004	0.0054
No	823	59.5	560				
<b>Client trying to harm other people by setting fire to property</b>							
Yes	13	86.7	2	4.06	3.98*	0.05	0.0019
No	1091	61.5	682				
<b>Client trying to set fire to other people</b>							
Yes	18	72.0	7	1.60	1.13	0.29	0.0005
No	1086	61.6	677				
<b>How did lighting the fire make the client feel - Positive Feelings</b>							
Yes	275	61.8	170	1.00	0.00	0.97	0
No	830	61.7	515				
<b>How did lighting the fire make the client feel - Negative Feelings</b>							
Yes	475	58.6	336	0.78	6.28**	0.01	0.0026
No	630	64.4	349				
<b>What did the client do after the fire started – Put it out</b>							
Yes	498	60.1	330	0.87	2.13	0.14	0.0009
No	604	63.5	347				
<b>What did the client do after the fire started – Called for help</b>							
Yes	42	48.8	44	0.57	6.59**	0.01	0.0027
No	1060	62.6	633				
<b>What did the client do after the fire started – Ran away</b>							
Yes	414	70.6	172	1.77	28.08***	<.0001	0.0121
No	688	57.7	505				
<b>What did the client do after the fire started – Stayed</b>							
Yes	220	58.5	156	0.83	2.39	0.12	0.001
No	882	62.9	521				
<b>What did the client do after the fire started – Other</b>							
Yes	6	54.5	5	0.74	0.26	0.61	0.0001
No	1096	62.0	672				

Note: +The percentage represents the percentage of subjects who exhibited that characteristic

\* p <.05, \*\* p<.01 \*\*\*p<.001

Table 11

*Results of each building step of the multivariable model building for the predictor model of offending post intervention*

Step	Variables	$R^2$	AUC	OR	Sensitivity	Specificity
<b>1</b>	<b>Any previous offence</b>	0.092	0.668	5.1	0.50	0.84
<b>2</b>	<b>Any previous offence</b>	0.122	0.721	3.8 2.5	0.76	0.59
	<b>Older age group</b>					
<b>3</b>	<b>Any previous offence</b>	0.137	0.742	3.2 2.1	0.70	0.66
	<b>Older age group</b>			2.0		
	<b>Referral fire incident set at Home</b>					
<b>4</b>	<b>Any previous offence</b>	0.158	0.759	2.8 2.0	0.76	0.62
	<b>Older age group</b>			2.3		
	<b>Referral fire incident set at Home</b>			2.4		
	<b>Four or more conduct problem behaviours</b>					
<b>5</b>	<b>Any previous offence</b>	0.169	0.770	2.6 2.2	0.61	0.78
	<b>Older age group</b>			2.4		
	<b>Referral fire incident set at Home</b>			2.0		
	<b>Four or more conduct problem behaviours</b>					
	<b>Involvement with CYF</b>			1.8		

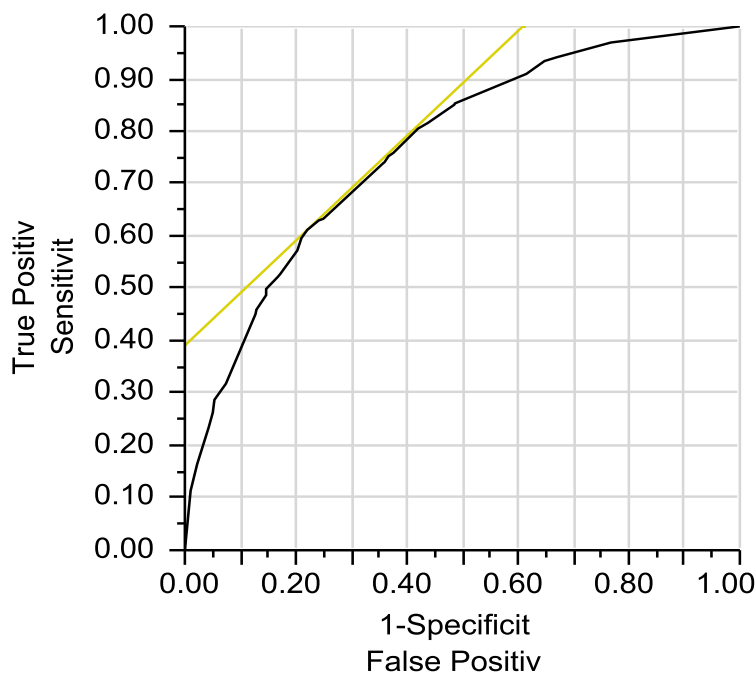


Figure 9. Receiver operator characteristic (ROC) curves for predictors of offending post-FAIP intervention

### **Post-Intervention Offending Severity Univariable and Multivariable Analyses**

Of the children and adolescents in the sample, 20.2% committed serious offences, 55.5% committed moderate, and 45.3% committed minor offences post-intervention.

#### **Univariable analyses of factors associated with post-FAIP intervention offending severity**

The above tests concerning factors relating to offending adopt a very broad definition of offending that is defined only by whether an individual had a record of any offending behaviour after their FAIP intervention. Further analysis was therefore undertaken to determine whether employment of a more descriptive and precise measure of offending produced a different set of results. A measure of offending severity which labelled an offender based on the most serious offence they had committed following their FAIP intervention was created. Results indicated small and subtle differences in terms of the variables that were associated with increased post-intervention offending severity, compared with the variables that were associated with any post-intervention. These differences are unlikely, without further research, to provide any information over and above that of the previous analyses that is useful for practical application in terms of work with firesetting populations.

Tables 12 to 15 show the univariable analyses for none/mild, moderate and severe general offending post-FAIP intervention across demographic, psychosocial/emotional, conduct problems, and fire specific variables. As shown in Table 12, for example, there was a significant difference between those aged 11

years and younger and those aged 12 years and older across offending post-intervention severity. Those aged 12 years and older were more likely to have moderate and severe offences post-intervention than those aged up to 11 years of age.

### ***Multivariable modelling for future post-FAIP intervention offending severity***

As shown in Table 11, the final predictor model had seven variables: previous offending, four or more conduct problem behaviours, age (grouped), whether the fire was set at home, whether the location of the referral fire incident was at home, prior involvement with CYF, a diagnosis of ADHD, and gender. The seven predictor model accounted for 13.3% of the variance for offending severity post intervention. The area under the ROC curve (AUC) for moderate and severe offending post-FAIP intervention was fair, with 0.769 for moderate offending, and 0.760 for severe offending.

Table 16 and Figure 10 show the results of the multivariable model building for the predictor model of offending severity (moderate, severe) post-FAIP intervention.

Although this study has not found pronounced differences in results when using different definitions and measures of offending, this does not necessarily indicate that distinguishing between different offending types is not of importance in research.

Table 12

*Frequencies, Percentages, Odds Ratios (OR), and Chi Squared Statistics of Demographics, Assessment and Intervention Predictors of Severity of Offending Post-Intervention*

Variable	General Offence Severity						$\chi^2$	p-value
	None/Minor		Moderate		Severe			
	n	% <sup>+</sup>	n	% <sup>+</sup>	N	% <sup>+</sup>		
<b>Age at referral</b>								
Up to 11 years	480	59.3	226	27.9	103	12.7	155.34***	<.0001
12 years and older	293	29.9	430	43.8	258	26.3		
<b>Gender</b>								
Male	669	41.8	595	37.1	338	21.1	14.97***	0.0001
Female	104	55.3	61	32.4	23	12.2		
<b>Ethnicity</b>								
European	525	44.1	443	37.2	223	18.7	8.42	0.08
Asian	10	66.7	3	20.0	2	13.3		
Maori	181	39.3	173	37.5	107	23.2		
Pacific	37	47.4	25	32.1	16	20.5		
Other	8	53.3	4	26.7	3	20.0		
<b>Deprivation Score</b>								
1 to 6	347	44.4	296	37.9	138	17.7	2.81	0.09
7 to 10	394	42.0	337	36.0	206	22.0		
<b>Referred on to another agency</b>								
Yes	48	35.0	51	37.2	38	27.7	7.98*	0.02
No decision made yet	43	38.7	41	36.9	27	24.3		
No	665	44.2	552	36.7	288	19.1		
<b>Current Residence</b>								
Home	748	44.3	618	36.6	324	19.2	27.94***	<.0001
Institution	4	11.8	13	38.2	17	50.0		
Other	20	31.3	24	37.5	20	31.3		
<b>Who client lives with</b>								
Parents	711	44.4	580	36.2	310	19.4	11.28**	0.004
Caregiver or Foster	35	30.4	51	44.3	29	25.2		
Other	26	35.6	25	34.2	22	30.1		

Note: <sup>+</sup>The percentage represents the percentage of subjects who exhibited that characteristic

\* p <.05, \*\* p<.01 \*\*\*p<.001



Table 13

*Frequencies, Percentages, Odds Ratios (OR), and Chi Squared Statistics of Psychosocial/Emotional and Environmental Predictors of Severity of Offending Post-Intervention*

Variable	General Offence Severity							
	None/Minor		Moderate		Severe		$\chi^2$	<i>p</i> -value
	<i>n</i>	% <sup>+</sup>	<i>n</i>	% <sup>+</sup>	<i>N</i>	% <sup>+</sup>		
<b>Ever been given a psychiatric diagnosis</b>								
Yes	106	32.8	121	37.5	96	29.7	25.99***	<.0001
No	667	45.5	535	36.5	265	18.1		
<b>Any current psychiatric diagnosis</b>								
Yes	130	33.3	139	35.6	121	31.0	34.44***	<.0001
No	640	45.8	517	37.0	240	17.2		
<b>Multiple current psychiatric diagnoses</b>								
One	79	33.9	89	38.2	65	27.9	35.78***	<.0001
Multiple	51	32.5	50	31.8	56	35.7		
No	640	45.8	517	37.0	240	17.2		
<b>Attention Deficit Hyperactivity Disorder Diagnosis</b>								
Yes	86	30.8	95	34.1	98	35.1	39.82***	<.0001
No	684	45.4	561	37.2	263	17.4		
<b>Conduct Disorder Diagnosis</b>								
Yes	25	31.3	25	31.3	30	37.5	11.47***	0.0007
No	745	43.6	631	37.0	331	19.4		
<b>Oppositional Defiant Disorder Diagnosis</b>								
Yes	25	27.2	32	34.8	35	38.0	18.21***	<.0001
No	745	44.0	624	36.8	326	19.2		
<b>Obsessive Compulsive Disorder Diagnosis</b>								
Yes	10	34.5	14	48.3	5	17.2	0.26	0.61
No	760	43.2	642	36.5	356	20.3		
<b>Depression Diagnosis</b>								
Yes	29	39.2	25	33.8	20	27.0	1.35	0.25
No	741	43.3	631	36.8	341	19.9		
<b>Anxiety Diagnosis</b>								
Yes	24	37.5	21	32.8	19	29.7	2.33	0.13
No	746	43.3	635	36.9	342	19.8		
<b>Aspergers Diagnosis</b>								
Yes	14	46.7	10	33.3	6	20.0	0.10	0.76
No	756	43.0	646	36.8	355	20.2		
<b>Any Mental Health Problems</b>								
Yes	395	38.8	374	36.7	250	24.5	29.52***	<.0001
No	377	49.0	282	36.6	111	14.4		
<b>Multiple Mental Health Problems</b>								
One	121	43.8	92	33.3	63	22.8	32.78***	<.0001

Multiple	274	36.9	282	38.0	187	25.2		
No	377	49.0	282	36.6	111	14.4		
<b>Hyperactivity</b>								
Yes	152	38.6	148	37.6	94	23.9	5.80*	0.02
No	620	44.4	508	36.4	267	19.1		
<b>Poor concentration</b>								
Yes	240	36.6	253	38.6	162	24.7	21.81***	<.0001
No	532	46.9	403	35.5	199	17.5		
<b>Depression</b>								
Yes	46	30.7	62	41.3	42	28.0	11.63***	0.0006
No	726	44.3	594	36.2	319	19.5		
<b>Self harm</b>								
Yes	37	31.6	48	41.0	32	27.4	7.55**	0.006
No	735	44.0	608	36.4	329	19.7		
<b>Anger</b>								
Yes	232	36.3	231	36.1	177	27.7	33.40***	<.0001
No	540	47.0	425	37.0	184	16.0		
<b>Anxiety</b>								
Yes	122	36.6	124	37.2	87	26.1	10.54***	0.001
No	650	44.6	532	36.5	274	18.8		
<b>Learning problems</b>								
Yes	203	39.0	184	35.4	133	25.6	10.41***	0.001
No	569	44.8	472	37.2	228	18.0		
<b>Previously referred to counselling/formal mental health service</b>								
Yes	204	34.6	221	37.5	165	28.0	38.85***	<.0001
No	566	47.3	435	36.3	196	16.4		
<b>Currently under referral to another agency</b>								
Yes	188	31.3	235	39.2	177	29.5	69.51***	<.0001
No	585	49.2	421	35.4	183	15.4		
<b>Any Experienced Abuse</b>								
Yes	221	32.6	258	38.1	199	29.4	69.04***	<.0001
No	540	49.2	396	36.1	161	14.7		
<b>Physical Abuse</b>								
Yes	150	30.4	192	38.9	152	30.8	61.28***	<.0001
No	611	47.7	461	36.0	208	16.3		
<b>Sexual Abuse</b>								
Yes	77	28.8	106	39.7	84	31.5	34.00***	<.0001
No	684	45.4	547	36.3	275	18.3		
<b>Neglect</b>								
Yes	129	31.8	148	36.5	129	31.8	44.70***	<.0001
No	632	46.3	504	36.9	230	16.8		
<b>Any Physical and/or Sexual Abuse</b>								
Yes	177	31.2	225	39.6	166	29.2	60.95***	<.0001

No	584	48.4	429	35.5	194	16.1		
<b>Client report stress in the family</b>								
Yes	222	39.5	223	39.7	117	20.8	3.28	0.07
No	547	44.9	430	35.3	240	19.7		
<b>Client suffered from a head injury</b>								
Yes	83	30.7	113	41.9	74	27.4	21.73***	<.0001
No	684	45.4	542	35.9	282	18.7		
<b>Involvement with CYF</b>								
Yes	262	32.7	306	38.2	233	29.1	90.07***	<.0001
No	502	51.4	347	35.6	127	13.0		
<b>Any Placement</b>								
Yes	47	22.4	81	38.6	82	39.0	62.25***	<.0001
No	717	45.8	570	36.4	277	17.7		
<b>Multiple Placements</b>								
Yes	34	23.6	54	37.5	56	38.9	37.90***	<.0001
No	730	44.8	597	36.6	303	18.6		
<b>5 or more placements</b>								
Yes	13	20.6	25	39.7	25	39.7	19.05***	<.0001
No	751	43.9	626	36.6	334	19.5		
<b>Domestic violence present</b>								
Yes	96	28.7	133	39.8	105	31.4	45.42***	<.0001
No	688	46.4	518	36.0	254	17.6		
<b>Domestic violence witnessed by client</b>								
Yes	59	26.2	93	41.3	73	32.4	36.92***	<.0001
No	705	45.5	558	36.0	286	18.5		
<b>Suicide or self-harm indications</b>								
Yes	17	20.0	30	35.3	38	44.7	33.55***	<.0001
No	747	44.2	621	36.8	321	19.0		

Note: †The percentage represents the percentage of subjects who exhibited that characteristic

\* p <.05, \*\* p<.01 \*\*\*p<.001

Table 14

*Frequencies, Percentages, Odds Ratios (OR), and Chi Squared Statistics of Conduct Problems and Offending Related Predictors of Severity of Offending Post-Intervention*

Variable	General Offence Severity						$\chi^2$	p-value
	None/Minor		Moderate		Severe			
	N	% <sup>+</sup>	N	% <sup>+</sup>	N	% <sup>+</sup>		
<b>Any Conduct Problem Behaviour</b>								
Yes	423	36.4	441	38.0	297	25.6	83.39***	<.0001
No	350	55.6	215	34.2	64	10.2		
<b>Multiple Conduct Problem Behaviours</b>								
One	144	53.1	91	33.6	36	13.3	135.76***	<.0001
Multiple	279	31.3	350	39.3	261	29.3		
None	350	55.6	215	34.2	64	10.2		
<b>Aggression to People and Animals</b>								
Yes	186	32.7	195	34.3	187	33	72.30***	<.0001
No	587	48	461	37.7	174	14		
<b>Deceitfulness or Theft</b>								
Yes	335	35.4	353	37.3	258	27	73.96***	<.0001
No	438	51.9	303	35.9	103	12		
<b>Destruction of Property</b>								
Yes	132	27.8	196	41.3	147	31	76.37***	<.0001
No	641	48.7	460	35	214	16		
<b>Serious violation of Rules</b>								
Yes	136	26.6	202	39.5	174	34	114.47***	<.0001
No	638	49.9	454	35.5	187	15		
<b>Group offending</b>								
Yes	79	21.6	161	44.0	126	34.4	102.02***	<.0001
No	694	48.7	495	34.8	235	16.5		
<b>Four or more conduct problem behaviours</b>								
Yes	144	26.2	214	38.9	192	34.9	136.17***	<.0001
No	629	50.7	442	35.6	169	13.6		
<b>Sexualized behavior before age 12</b>								
Yes	41	23.6	72	41.4	61	35.1	38.32***	<.0001
No	723	45.2	579	36.2	298	18.6		
<b>Any previous offences</b>								
Yes	142	21.4	293	44.1	229	34.5	245.88***	<.0001
No	631	56.0	363	32.2	132	11.7		
<b>Previous Offence Count</b>								
Zero	631	56	363	32.2	132	12	317.85***	<.0001
1 or 2	133	26.9	232	46.9	130	26		
3 or 4	7	7.69	34	37.4	50	55		
5 to 10	2	3.28	24	39.3	35	57		
10+	0	0	3	17.6	14	82		

<b>Any serious previous offence</b>								
Yes	4	8.0	20	40.0	26	52.0	38.09***	<.0001
No	769	44.2	636	36.6	335	19.3		
<b>Any moderate previous offence</b>								
Yes	132	21.8	273	45.0	201	33.2	193.19***	<.0001
No	641	54.1	383	32.3	160	13.5		
<b>Any minor previous offence</b>								
Yes	25	11.3	80	36.0	117	52.7	179.29***	<.0001
No	748	47.7	576	36.7	244	15.6		
<b>Conviction for previous offence</b>								
Yes	1	2.6	16	42.1	21	55.3	36.27***	<.0001
No	772	44.1	640	36.5	340	19.4		
<b>Previous offence - Arson</b>								
Yes	94	23.2	191	47.0	121	29.8	82.03***	<.0001
No	679	49.1	465	33.6	240	17.3		
<b>Previous offence - Administrative</b>								
Yes	0	0.0	2	22.2	7	77.8	15.95***	<.0001
No	773	43.4	654	36.7	354	19.9		
<b>Previous offence - Traffic</b>								
Yes	1	4.3	11	47.8	11	47.8	16.68***	<.0001
No	772	43.7	645	36.5	350	19.8		
<b>Previous offence - Violence</b>								
Yes	1	4.3	11	47.8	11	47.8	16.68***	<.0001
No	772	43.7	645	36.5	350	19.8		
<b>Previous offence - Sexual</b>								
Yes	0	0.0	6	50.0	6	50.0	10.30***	0.001
No	773	43.5	650	36.6	355	20.0		
<b>Previous offence – Property damage</b>								
Yes	120	22.4	242	45.1	174	32.5	148.19***	<.0001
No	653	52.1	414	33.0	187	14.9		
<b>Previous offence - Miscellaneous</b>								
Yes	11	14.5	23	30.3	42	55.3	54.43***	<.0001
No	762	44.5	633	36.9	319	18.6		
<b>Previous offence – Drugs and antisocial behaviour</b>								
Yes	1	1.4	38	52.1	34	46.6	57.43***	<.0001
No	772	45.0	618	36.0	327	19.0		
<b>Previous offence - Dishonesty</b>								
Yes	28	10.9	103	40.1	126	49.0	191.11***	<.0001
No	745	48.6	553	36.1	235	15.3		

Note: †The percentage represents the percentage of subjects who exhibited that characteristic

\* p <.05, \*\* p<.01 \*\*\*p<.001

Table 15

*Frequencies, Percentages, Odds Ratios (OR), and Chi Squared Statistics of Fire Specific Predictors of Severity of Offending Post-Intervention*

Variable	General Offence Severity							$\chi^2$	p-value
	None/Minor		Moderate		Severe				
	N	% <sup>+</sup>	N	% <sup>+</sup>	N	% <sup>+</sup>			
<b>How many times has client used fire inappropriately</b>									
First time	315	46.7	249	36.9	111	16.4	27.71***	<.0001	
2 to 4 times	283	45.2	223	35.6	120	19.2			
More than 4 times	136	33.3	159	39.0	113	27.7			
<b>Location of referral fire incident - Home</b>									
Yes	355	62.9	146	25.9	63	11.2	131.40***	<.0001	
No	418	34.1	510	41.6	298	24.3			
<b>Location of referral fire incident - School</b>									
Yes	197	36.8	227	42.4	112	20.9	8.04**	0.005	
No	576	45.9	429	34.2	249	19.9			
<b>Motivation – Antisocial</b>									
Yes	52	38.8	48	35.8	34	25	2.12	0.15	
No	721	43.5	608	36.7	327	20			
<b>Motivation – Attention</b>									
Yes	49	50.5	26	26.8	22	22.7	0.76	0.38	
No	723	42.7	630	37.2	339	20.0			
<b>Motivation – Boredom</b>									
Yes	190	34.7	226	41.3	131	23.9	21.30***	<.0001	
No	582	46.9	430	34.6	230	18.5			
<b>Motivation – Experiment</b>									
Yes	275	57.1	146	30.3	61	12.7	55.75***	<.0001	
No	497	38.0	510	39.0	300	23.0			
<b>Motivation – Peer Pressure</b>									
Yes	115	40.4	95	33.3	75	26.3	3.97*	0.05	
No	657	43.7	561	37.3	286	19.0			
<b>Motivation – Unable to identify a reason</b>									
Yes	156	42.3	145	39.3	68	18.4	0.01	0.91	
No	616	43.4	511	36.0	293	20.6			
<b>Motivation – Other</b>									
Yes	12	31.6	16	42.1	10	26.3	2.13	0.14	
No	760	43.4	640	36.6	351	20.0			
<b>Destruction of property intended</b>									
Yes	59	26.0	100	44.1	68	30.0	32.77***	<.0001	
No	714	45.7	556	35.6	293	18.7			
<b>Client part of a group at the time of fire</b>									
Yes	542	39.6	529	38.7	297	21.7	28.80***	<.0001	
No	231	54.7	127	30.1	64	15.2			

<b>Was there an accelerant used</b>								
Yes	141	34.7	172	42.4	93	22.9	12.49***	0.0004
No	632	45.7	484	35.0	267	19.3		
<b>Client trying to harm other people by setting fire to property</b>								
Yes	5	33.3	7	46.7	3	20.0	0.30	0.58
No	767	43.3	649	36.6	357	20.1		
<b>Client trying to set fire to other people</b>								
Yes	8	32.0	11	44.0	6	24.0	1.05	0.31
No	764	43.3	645	36.6	354	20.1		
<b>How did lighting the fire make the client feel - Positive Feelings</b>								
Yes	189	42.5	154	34.6	102	23	0.95	0.33
No	584	43.4	502	37.3	259	19		
<b>How did lighting the fire make the client feel - Negative Feelings</b>								
Yes	382	47.1	292	36	137	17	12.86	0.00
No	391	39.9	364	37.2	224	23		
<b>What did the client do after the fire started – Put it out</b>								
Yes	372	44.9	296	35.7	160	19.3	2.28	0.13
No	393	41.3	358	37.6	200	21.0		
<b>What did the client do after the fire started – Called for help</b>								
Yes	49	57.0	23	26.7	14	16.3	5.99**	0.01
No	716	42.3	631	37.3	346	20.4		
<b>What did the client do after the fire started – Ran away</b>								
Yes	203	34.6	235	40.1	148	25.3	27.51***	<.0001
No	562	47.1	419	35.1	212	17.8		
<b>What did the client do after the fire started – Stayed</b>								
Yes	173	46.0	139	37.0	64	17.0	2.96	0.09
No	592	42.2	515	36.7	296	21.1		
<b>What did the client do after the fire started – Other</b>								
Yes	6	54.5	2	18.2	3	27.3	0.12	0.73
No	759	42.9	652	36.9	357	20.2		

Note: †The percentage represents the percentage of subjects who exhibited that characteristic

\* p <.05, \*\* p<.01 \*\*\*p<.001

Table 16

*Results of each building step of the multivariable modelling for the predictor model of offending severity post intervention*

Step	Variables	$R^2$	AUC Moderate Offending	AUC Severe Offending
1	Any previous offence	0.065	0.664	0.664
2	Any previous offence Four or more conduct problem behaviours	0.088	0.705	0.716
3	Any previous offence Four or more conduct problem behaviours Age at referral (<11 years; 12+ years)	0.103	0.739	0.730
4	Any previous offence Four or more conduct problem behaviours Age at referral (<11 years; 12+ years) Referral fire incident set at Home	0.112	0.749	0.733
5	Any previous offence Four or more conduct problem behaviours Age at referral (<11 years; 12+ years) Referral fire incident set at Home Involvement with CYF	0.124	0.759	0.751
6	Any previous offence Four or more conduct problem behaviours Age at referral (<11 years; 12+ years) Referral fire incident set at Home Involvement with CYF Diagnosis of ADHD	0.130	0.764	0.755



7	Any previous offence	0.133	0.769	0.760
	Four or more conduct problem behaviours			
	Age at referral (<11 years; 12+ years)			
	Referral fire incident set at Home			
	Involvement with CYF			
	Diagnosis of ADHD			
	Gender			

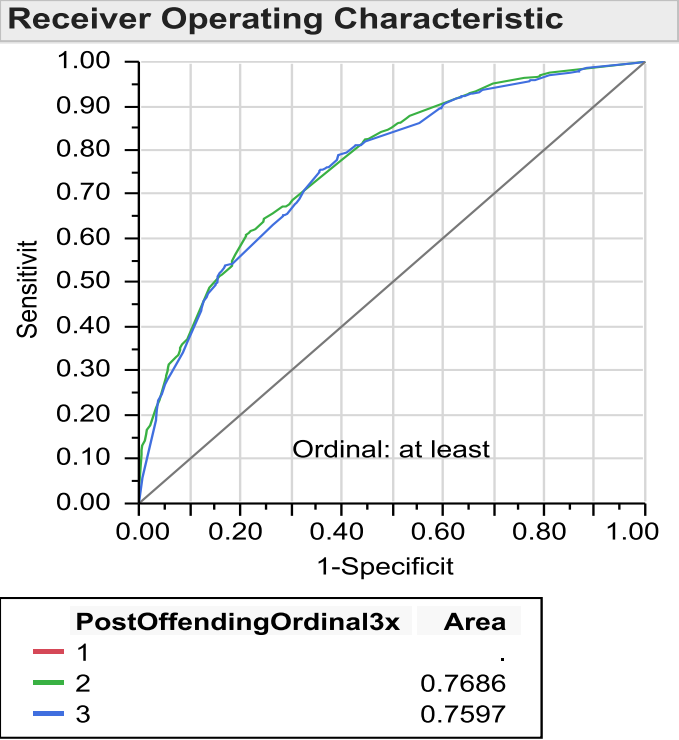


Figure 10. Receiver operator characteristic (ROC) curves for predictors of moderate (2) and severe (3) offending post-FAIP intervention

## Summary

- The variables that were associated with offending in this sample were for the most part, those that are known to be associated with offending in other samples.
- The high rates of offending in this sample in addition to the many relationships between firesetting, conduct problem behaviours and ongoing offending support the idea that for at least a significant proportion of deliberate firesetting children and adolescents, firesetting may be best understood within the framework of antisocial behaviour.

## Firesetting subtypes

Given that firesetters are a heterogeneous group that exhibit wide variation in their fire related behaviours as well as accompanying pathology, there are likely to be a number of differing developmental pathways, and distinct types of firesetters. However, firesetting typologies have until recently been predominantly theoretically based and empirically derived typologies are in emerging phases. Categorisation should ideally reflect and acknowledge the numerous individual, environmental and situational factors that are likely to contribute to maladaptive fire behaviour, in order to be of practical value and able to adequately inform intervention approaches.

Traditionally, theory concerning firesetting typologies categorised firesetters based on motivation. The most prevalent of these theories is that presented by Fineman (1995) who proposed two broad types of firesetter each with a number of subtypes - *Non-pathological* (Curiosity firesetter, Accidental firesetter) and *Pathological*, (Cry-for-help firesetter, Delinquent firesetter, Severely Disturbed firesetter, Cognitively Impaired firesetter and Sociocultural firesetter). Fineman's typology has been only partially supported by research that has found significant differences between the pathological and non-pathological subtypes on measures of pathology, delinquency or social skills, but no differences between subtypes within the pathological and non-pathological groups, suggesting that motivational subtypes are unlikely to each represent a distinct developmental pathway (Slavkin, 2001b).

The four subtypes most prevalent in current firesetting discourse are as follows (Kolko, 2002): The *curiosity firesetter* who is understood to be young with experimental intentions and a lack of family dysfunction or psychopathology; the *cry-for-help firesetter* whose behaviour is a means of gaining attention and is related to environmental dysfunction and stressors; the *delinquent firesetter* who is characterised by behavioural dysfunction and deviancy; and the *severely disturbed firesetter*, a very small group characterised by significant individual pathology. Firesetting behaviour has been found to involve multiple motivations (Kolko & Kazdin, 1991a) indicating the limited reliability utility of motivational typologies. Additionally, studies indicating an association on between curiosity and more severe, frequent and persistent firesetting behaviour challenge the notion of 'curiosity firesetters' as the least pathological firesetting subtype (Del Bove & MacKay, 2011; MacKay et al., 2006; Kolko & Kazdin, 1991a).

Arson has been categorised by fire event-specific 'themes' reflecting the combined motivation or source of the firesetting (instrumental or expressive) and the target (person or object) (Canter & Fritzon, 1998). Santtila et al. (2003) found that the four 'themes' of arson suggested by Canter and Fritzon (1998) were evident in a selected sample of child and adolescent firesetters drawn from the sample of the original study. However, the structural properties of firesetting were not found to closely correspond with background offender characteristics. Firesetting was found to be often associated with delinquency or psychopathology; delinquency being more associated with instrumental forms of firesetting, and psychopathology with expressive firesetting. The **expressive-person** theme represented internal motivation and a need to express stress or seek attention, and was related to female gender, a diagnosis of depression and a personality or conduct disorder and institutionalisation. The **instrumental-person** theme related to firesetting being a reaction against an unpleasant external event that, for example

provokes anger and subsequent seeking of revenge and was associated with criminality and antisociality. The **expressive-object** theme related to internal motivation but external non-person, non-symbolic targets and associated with institutionalisation and diagnosis of personality disorder. Behaviour tends to be serial and firesetters stay at the scene possibly suggesting some level of fire fascination. The **instrumental-object** theme primarily involved firesetting as means of aiding criminality and was associated with male gender, cautions by the police, previous convictions and a history of firesetting.

More recently, the first empirically derived firesetting typology (Del Bove & MacKay, 2011), derived three distinct firesetting clusters using cluster analysis techniques. The subtypes differed on measures of firesetting severity, individual, environmental and fire-specific variables thus indicating the need for a comprehensive multifactor typological description of firesetters. Although derived from a relatively serious sample, this study indicated that approaching firesetting within the context of antisocial behaviour is unlikely to be useful in enhancing understandings of all firesetters.

The **Conventional-limited (CL)** cluster had the least severe and latest onset of firesetting behaviour which was less antisocially motivated and for which they were most often remorseful and had the least risk of future fire involvement. This group is characterised by greater family stability and the lowest levels of child psychopathology. The **Home-instability-moderate (HM)** cluster were the middle cluster in terms of firesetting severity as well as the extent to which they exhibited increased social, attentional and externalising behavioural problems. However, notably, this cluster was characterised by the greatest family dysfunction including the least parental involvement and the highest rates of abuse, maternal psychopathology and rates of child welfare care. Their behaviour was similarly likely as that of the MP cluster to be antisocially motivated but more likely to follow the experience of an immediate stressor. The **Multi-risk Persistent (MP)** cluster exhibited the most severe firesetting behaviour, the highest level of fire curiosity, the earliest age of onset and highest rates of recidivism. This cluster tended to be academically below average and to present with clinically significant levels of social skill deficits, externalising behaviours and attentional difficulties.

Issues concerning subtypes have been complicated by ideas surrounding gender differences with authors suggesting that there may be gender differences in the reasons for firesetting behaviour and that child firesetters are likely to be less severe than adolescent firesetters. While there are many similarities between male and female firesetters (Roe-Sepowitz & Hickie, 2011), research also indicates that a number of different factors may be associated with firesetting for boys and girls (Dadds & Fraser, 2006; Martin et al., 2004; Roe-Sepowitz & Hickie, 2011) and that firesetting is more associated with delinquency for boys (Roe-Sepowitz & Hickie, 2011) but with 'expressive' motives and the event of crisis for girls (Roe-Sepowitz & Hickie, 2011; Santtila et al., 2003). However, literature indicating that similar percentages of females are present in different severity groups (Martin et al., 2004) and across empirically derived firesetting clusters (Del Bove & MacKay, 2011) suggesting that females may not constitute a distinct firesetting 'type'.

The relationship between firesetting behaviours, antisociality, fire specific and general risk factors and future offending remains unclear; and the potentially varying developmental trajectories involving an interaction of these factors have yet to be sufficiently investigated. Further research concerning firesetting typologies which builds on the limited base of existing knowledge would guide more effective and appropriately targeted prevention and intervention.

## Cluster Analysis

Variables considered for use in cluster analysis included those that have been found by research as being associated with firesetting, firesetting severity or firesetting recidivism. Additionally, factors which have been previously used by authors and practitioners as ways of grouping firesetters were also considered. Of those, variables were not included if they had too much missing data, or where the variable was too infrequent or is too frequent (i.e. had little variation) and therefore had limited statistical use. Through a process of analysis, variables that didn't differentiate between clusters (i.e. things that were relatively equally frequent across all cluster groups) were excluded. To define whether something was "differentiating" or not a chi-square contingency analysis was run for each item against the clusters and excluded using a cut-off of R-Squared < 0.04 and  $p < 0.005$ . This resulted in a final cluster analysis incorporating the 15 variables in Table 17. A five-cluster solution differentiated between fifteen factors was obtained. The results are presented in Table 17.

Table 17

*Percentages of Demographic, Psychosocial/Emotional, Conduct Problem, and Fire Specific Variables for the Five Identified Profile Groups*

Variable		Cluster Number					$R^2$	$\chi^2$
		A	B	C	D	E		
		(n = 602) %	(n = 341) %	(n = 366) %	(n = 311) %	(n = 144) %		
Previous Offending Count	None	100	98	47	0	0	0.43	2758.0
	1 or 2 times	0	2	49	96	0		
	3 or 4 times	0	0	4	4	46		
	5 to 10 times	0	0	0	0	42		
	10 or more	0	0	0	0	12		
Previous arson offence	Yes	0	0	29	68	59	0.16	752.5
Involvement with CYF	Yes	2	96	70	31	76	0.23	989.4
Experienced any abuse	Yes	2	81	61	23	65	0.17	753.1
Any psychosocial/emotional problems	Yes	41	65	95	26	74	0.09	428.6
Previous Counselling	Yes	11	26	83	13	54	0.12	639.9
Under referral to agency	Yes	12	33	69	22	62	0.08	401.2
Conduct Problem Behaviour - Destruction of property	Yes	11	19	54	13	66	0.07	371.2
Conduct Problem Behaviour - Serious violation of rules	Yes	15	21	52	20	63	0.05	258.1
Conduct Problem Behaviour - Often lies and/or stealing	Yes	33	55	84	38	85	0.07	334.1
Ever been given psychiatric diagnosis	Yes	4	9	60	1	31	0.10	602.9
Any current psychiatric diagnosis	Yes	5	14	66	6	31	0.10	583.6
Domestic Violence Present	Yes	0	45	23	15	33	0.07	310.7
Referral fire incident set at home	Yes	39	45	39	4	8	0.05	194.7
Age	0 to 11 years	55	67	37	24	13	0.04	220.3

*Note: p < 0.0001 for all variables*  
Shading indicates variables that are predominant

## **Discussion**

A five-cluster solution that differentiated between fifteen factors was obtained. The five clusters show variation in terms of the

### **Cluster A**

Cluster A was the largest group and had no offending and was marginally predominantly younger (up to 11 years of age) (55%). This cluster had extremely low levels of Care and Protection contact (2%), abuse histories (2%) and no individuals in this sample had records of domestic violence in their family. Diagnoses were very rare among this group. However, 41% had psychosocial/emotional problems, 33% often lied or stole, 11% had engaged in destruction of property, and 15% has seriously violated rules.

Despite being the cluster with the lowest risk profile, it is notable that this cluster has a 44% probability of reoffending. This reiterates the importance of not assuming that firesetting children and adolescents are low risk given that the population in general appears to be at high risk of reoffending.

### **Cluster B**

Cluster B had minimal offending (2%) prior to FAIP intervention and were predominantly younger (up to 11 years of age) (67%). In contrast to Cluster A, this cluster had extensive Care and Protection histories (98%), previous experience of abuse (81%), and often lie and/or steal (55%). Domestic violence was present in the families of almost half of this cluster (45%). Diagnoses were relatively uncommon, but 65% reported psychosocial/emotional problems, 26% had received counselling, and 33% were under referral to other agencies. Highest proportion of children.

This cluster had a 54% probability of reoffending. Although this is the second lowest reoffending rate of all 5 clusters, this likely reflects the young age of this cluster given their high risk profile. It is possible that a longer follow up which captured the behaviours of these individuals at an older age would show increased post-intervention offending.

### **Cluster C**

Cluster C was made up of some offenders, but with largely lower frequency of previous offences, and who were predominantly older (12 or more years of age). Most had previous involvement with CYF (70%), previous experience of abuse (61%), psychosocial/emotional problems (95%), various conduct related problems, had previous counselling (83%), and were currently under referral to another agency (69%). Diagnoses were also reported by over half of the sample.

As would be expected from the high risk profile of this cluster, it had a 75% probability of reoffending.

### **Cluster D**

As shown in Table 17, Cluster D was made up of offenders with low counts of previous offences (96% offended one or two times), and high rates of arson offending (61%). In addition this cluster were

predominantly older (12 or more years of age). The arson offending in this cluster probably reflects their older age and that many of the firesetting events that resulted in referral to the FAIP, had come to the attention of the Police, thus resulting in a offending record for arson. This cluster had almost no reported previous psychiatric diagnoses (1%), very low rates of current diagnoses, and low rates of previous counselling (13%). This cluster had moderate rates of psychosocial/emotional problems (26%), Care and Protection histories (31%) and abuse (23%). In terms of conduct problem behaviours destruction of property was reported by 13% of this sample, serious violation of rules by 20% and often lying and/or stealing by 38%. The vast majority (96%) did not set the referral fire at home.

It could be expected that given the comparatively low rates of risk factors in this sample that it may have lower rates of ongoing offending. However, this cluster had a 76% probability of reoffending. It is possible that the offending engaged in by this cluster is adolescent-limited in nature, however a longer follow up period would be necessary to confirm this.

### **Cluster E**

Cluster E was the smallest group, and most severe cluster. It was comprised of offenders with high counts of previous offences, including arson. This cluster were predominantly older and had the greatest number of adolescents compared with all the other clusters. Most had previous involvement with CYF (76%), previous experience of abuse (65%), psychosocial/emotional problems (64%), various conduct related problems, had previous counselling (54%), and were currently under referral to another agency (62%).

This cluster had the extremely high rates of reoffending following their intervention (95%) and could therefore be considered the highest risk group.

Although this group was the smallest group, it still represented 8% of the sample, suggesting that almost one in ten individuals who has contact with the FAIP for deliberate firesetting would fall within this extremely high risk group



## **Strengths and Limitations**

### **Strengths**

- This study employed a very large sample (N=1790), much larger than those typically used in firesetting research (see Lambie & Randell, 2011 for a review). To our knowledge, this is the largest sample ever used in the international body of research concerning firesetters, with the exception of studies drawing from community sample survey data.
- Data was drawn from multiple governmental agency databases as well as the FAIP data. Broad individual, environmental and fire specific variables were included to help ensure that the study best reflected the heterogeneous nature of firesetting populations.
- In examining the offending behaviours of a firesetting sample, the current study addressed a key area of concern and interest in the firesetting literature that has not previously been the subject of any significant body of research.
- The sample was drawn from the FAIP, which is a fire service operated fire safety intervention programme typical of those which constitute common intervention practice internationally. It is therefore likely that the findings of this study are able to be of practical use for firesetting intervention programmes worldwide.
- A follow-up period of between 5 and 9 years was employed, which is substantial in comparison with other follow-up studies concerning firesetters. This increased the likelihood of more accurately capturing post-FAIP intervention offending behaviours.
- Many studies concerning firesetting behaviour employ samples of either children or adolescents. Both children and adolescents were included in this study, allowing for a direct examination of how these age groups may differ on various factors.
- The current study is one of very few research efforts internationally to address gender differences among firesetters. Because of its large sample size, gender differences were able to be examined in a statistically meaningful way which is something that is rare in research concerning firesetting populations.
- To the best of our knowledge, this study was only the second internationally to empirically derive firesetting subtypes, thus significantly contributing to developing understandings of firesetting typologies and challenging theoretical typologies that have existed for decades without empirical founding.

## Limitations

- A lack of standardised measures, and reliance on self- and parent-report in the FAIP dataset, meant that variables concerning mental health problems and psychosocial and emotional difficulties are likely to be less reliable than they may have been had standardised measures been used.
- The cluster analysis solution is limited in its generalizability, in that being drawn from a sample of deliberate firesetters referred to a fire safety intervention programme, may not translate well to clinical and community populations.
- There were a number of potentially important variables that were not available in the current study for use in the cluster analysis.
- Despite employing a relatively long follow-up period comparative to that of other studies, given that the sample was relatively young at the time of intervention, no individual in the sample would have been older than 27 years at the end of the follow-up period. This limited the ability of the study to comment on adolescent-limited offending, as those in the sample who were oldest at the time of data collection were not many years into young adulthood.
- Given that the study did not employ a non- firesetting comparison group, or a non firesetting but antisocial comparison group, it was not possible to clearly discern the extent to which the findings are unique to this population or common to other populations such as those of children and adolescents with non-firesetting behavioural problems.
- Due to the lack of control group, the current study was only able to suggest the behavioural and mental health profiles of males, females, children and adolescents involved in firesetting behaviour, but was not able to discern how, and to what extent these factors relate to firesetting.

## **Theoretical and Research Implications**

The current study is the largest study ever undertaken on children and adolescents who deliberately light fires. Due to the rich and complex data utilised by this study, it paves the way for both new clinical and theoretical developments in the field.

- Many of the theoretical firesetting typologies that were originally developed (i.e., Fineman, 1980) are challenged by research, such as the current study, which suggests the potential utility of empirically derived firesetting subtypes. Unlike theoretical typologies which typically determine subgroups by a single variable (most notable motivation), studies such as the current one suggest that subtypes which take into account a broad range of factors might better reflect the variation in this complex population. While numerous researchers have highlighted a need to look more widely than merely motivations if we are to fully understand firesetting behaviour, research has not followed such recommendations. This study therefore constitutes one of the earliest explorations into this area.
- The current study has highlighted the need for firesetting in children and adolescents to be understood in the context of youth offending and antisocial behaviour. The results indicate that many of these children come to the fire service from multi-problem families, often with an extensive history with Child, Youth and Family. We cannot ignore these findings and no other study has used the extensive linking of databases that we have and identified such an overwhelming link. These results cannot be ignored by Government and Policy Analysts in Ministries.
- Clear differences between children and adolescents were identified indicating that we can no longer view both groups of young people who deliberately light fires as being similar. Until now no research exists which have highlight how distinct both groups are and the different risk factors of these groups.
- This study challenges existing understandings of female and male firesetters, suggesting that although male firesetters are more severely antisocial, females also exhibit high rates of antisociality, and that both females and males have internalising difficulties. This has implications for the current body of literature concerning firesetters which tends to ignore the issue of gender and assume findings related to males are relevant females. However, although gender differences are likely subtle and complex, future research needs to consider gender in study design.
- The results of the current study are congruent with the conceptualisation of firesetting as being best understood within the context of antisocial behaviour (Forehand et al., 1991; Stickle & Blechman, 2002). Given the importance of deviant peers and peer group behaviours in the development general antisocial behaviour (McGloin, 2009), such a conceptualisation is further supported by the finding that the majority of referral firesetting incidents in this sample involved

group firesetting. This is not to say that all firesetting must be understood within this framework - around 35% of the entire sample had no reported conduct problems and a similar proportion had never offended (32%). Rather, firesetting behaviour in general cannot be divorced from a framework of antisociality and youth offending.

## **Practical Implications**

This study has identified that the majority of young people who are referred to the FAIP come with from multi-problem and chaotic families, many of which are of sufficient concern to warrant intervention by Child, Youth and Family. One of the most significant clinical implications identified in the current study is that many of the young people who are referred to the FAIP are at high risk to subsequent offending without intensive follow-up post from specialist mental health and counselling agencies post FAIP intervention.

- **Appropriate referral of high risk children and adolescents who receive the FAIP is extremely important**

The current study identified a group of at-risk children and adolescents who were at significant mental health and psychosocial needs, conduct problem behaviours, high risk of engagement in future offending behaviour, with over half of current sample offending following their intervention. Such needs are unlikely to be met by fire service fire safety interventions which constitute typical intervention practice (Palmer et al., 2007). It is therefore crucial that there are accurate assessment and referral systems are established within fire service interventions, so that those high risk individuals are referred to other professionals and services better equipped to address their needs.

- **Risk assessments are required**

The current study highlights the high need and risk profiles of many deliberate firesetters referred to the FAIP. The FAIP is neither equipped nor intended to meet the needs of high risk individuals with broad behavioural and mental health difficulties. Low rates of current contact with other agencies at the time of intervention, and low rates of referral onto other services is of real concern given the serious behavioural outcomes of this group of children and adolescents and indicate that despite the fire service staff being hard working and well meaning, they are failing to properly identify that many children who come to their service require intensive follow-up and intervention from specialist mental health services. This is unsurprising given that these skills are likely outside their realm of knowledge and expertise but suggests that this needs to change if we are going to meet the complex needs of these young people. Consequently, the implementation of a standardised assessment tool and revised FAIP questionnaire to inform decisions around referral onto appropriate counselling services is required. Accurate

assessment of needs and risk will maximise the likelihood of service provision that is responsive to such need. The most appropriate assessment measure to use is the Strengths and Difficulties Questionnaire given its validity and reliability, accessibility, and ease of administration.

- **Female firesetters also engage in conduct problem behaviours**

Contrary to beliefs in existing literature concerning firesetters, both male and female children and adolescents who engage in firesetting also engage in other antisocial behaviours and are at risk for future offending. Despite the presence of subtle differences in the mental health and behavioural profile of male and female firesetters in the current sample, there is no current evidence for the presence of gender specific intervention needs. Females should therefore not be assumed to be less widely antisocial than their male counterparts. Fire practitioners need to be cognisant of this and apply the same rigor to assessment, treatment and referral to girls as they do to boys.

- **Antisocial behaviour must be addressed**

Given the low rates of arson offending in this sample, yet high rates of general offending, it may be that in many cases antisocial behaviour in general is an equally important treatment target as firesetting itself. High rates of group firesetting, bullying and peer pressure in this sample highlight the importance of addressing deviant and problematic peer relationships in intervention. Treatment for those young people with high needs must include evidenced based models for children with conduct problems (see Church et al., 2013) and be multi-systemic, include intensive family involvement, yet at the same time not exclude fire safety behaviour.

- **Individualised intervention for firesetters is important**

Ultimately, children and adolescents who deliberately light fires are a heterogeneous population, and assessment and treatment must be highly individualised and appropriate for the specific client and their needs.

The FAIP are well placed for changing the negative trajectories of many young people by the use of appropriate and standardised assessment tool (SDQ) and also the appropriate referral to specialist mental health and family counselling settings. The FAIP are a cornerstone in multi-agency social sector and as such can have a profoundly positive impact on the lives of many of these young people. It is through the use of proper assessment, and referral processes that the FAIP will operate most effectively and clearly this study shows that changes are required more adequately meet the needs of this group of young people.

## **Directions for Future Research**

- Given that there are apparent differences between males and females as well as children and adolescents, it is possible that factors associated with later offending behaviours may differ between these groups. Future research should therefore consider risk for offending behaviour separately for these groups. Additionally given that developmental trajectories of antisocial behaviour have been found to differ somewhat between males and females, the interaction between age and gender on risk for offending in this sample is an area for future investigation.
- The firesetting clusters identified in the current study should be considered exploratory. These clusters are limited to the current sample and also limited by the clustering variables that were available in this study. There is a need for research which looks to empirically derive firesetting subtypes in a range of samples including those referred to interventions such as the FAIP, as well as in community samples. As an increased body of literature concerning firesetting subtypes emerges and Relationship between needs of different subtypes and intervention
- Given that many firesetting children and adolescents are referred to fire service operated intervention programmes, yet have complex needs, there is the need for the development of an empirical risk assessment measure which takes into account risk for both firesetting and other offending behaviours.

## **Conclusion**

The primary aims of the current study were to investigate antisocial behaviours and potential subtypes of firesetting children and adolescents within a sample of firesetters. Overall, the sample had a number of serious environmental adversity, psychosocial/emotional difficulties and severe behavioural problems, came from multi-problem and chaotic families, and had high needs in a range of areas.

These early problems, evident upon presentation at FAIP intervention, increase risk for future offending. The current study therefore identifies the need for early intervention (Blissett, et al., 2009a, 2009b). Due to the high risk nature and mental health needs of many of the young people who are referred to the FAIP, the practitioners need intensive training and supervision from trained mental health professionals in order to adequately meet the needs of these young people who deliberately light fires. Intensive assessment using the SDQ is required, to promote appropriate referral to mental health and family counselling services. Because appropriate referral of high risk children and adolescents who receive the FAIP is extremely important, the development and implementation of accurate risk assessments is crucial. Antisocial behaviour is likely to need to be addressed in tandem with firesetting given its prevalence in this population. Ultimately, children and adolescents who deliberately light fires are a heterogeneous population, and assessment and treatment must be highly individualised and appropriate for the specific client and their needs. The FAIP plays a vital role in the community in changing negative trajectories of many young people. As assessment and referral systems develop, and with research increasingly able to illustrate the relationships between various factors and firesetting behaviour, FAIP will continue to improve its provision of service to an extremely high risk population.

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## Appendices

### Appendix A - Offending Severity Categories

Severe		Moderate		Minor	
1200	Kidnapping and Abduction	1600	Minor assaults	3600	Vagrancy
1300	Robbery	1700	Intimidation/threats	3800	Family offences
1400	Grievous assaults	1800	Group Assemblies	3900	Sale of
1500	Serious assaults	2200	Sexual affront	4300	Liquor Act
2600	Sexual attacks	3100	Drugs (not cannabis)	4400	Receiving
2700	Abnormal sex	3200	Drugs (cannabis)	6100	Trespass
2800	Immoral behavior	3500	Disorder	6200	Littering
2900	Immoral behavior/misc	4100	Burglary	6300	Animals
3700	Family Offences	4200	Car conversion	6500	Postal/abuses
7500	Against national interest	4500	Fraud	7100	Against justice
		4600	Computer Crime	7600	Bylaw breaches
		5100	Destruction of property	7900	Justice special
		5110	Arson	B	Duties and obligations
		5200	Endangering	C	Warrant & COF
		5900	Drugs	E	Speeding offences
		6800	Firearm offences	F	Driver duties and
		A	Alcohol related offences	H	Road user charges and overloading
		D	Manner of driving	J	Speed camera offences
		G	Speeding	K	Transport licensing
		V	Vehicle	L	Driver licensing & vehicle licensing offences
				M	Logbooks, driving hours and vehicle related offences
				N	Vehicle related offences
				O	Pedestrian, horse, moped and cycle offences
				R	Miscellaneous
				W600	Sale of liquor offences

## Appendix B - Offence Type Categories

Offence Type	Offending subcategories
Violence	Homicide Kidnapping Robbery Grievous Assaults Serious Assaults Minor Assaults Intimidation and Threats Group Assemblies
Sexual	Sexual Affronts Sexual Attacks Abnormal Sex Immoral Behaviour Immoral Behaviour Misc.
Drugs and Antisocial	Drugs, Not Cannabis Drug, Cannabis Gaming Disorder Vagrancy Offences Family Offences Sale of Liquor Act
Dishonesty	Burglary Car Conversion Theft Receiving Fraud Computer Crime
Property Damage	Destruction of Property Endangering Gambling Act New Drugs
Property Abuses	Trespass Littering Animals Postal Abuses Firearms Offences Sentencing Act 2002
Administrative	Against Justice Births, Deaths and Marriages Immigration Racial Against National Interest By Law Breaches Justice (Special)