Models and Pathways to overcovering the Nature and Extent of Child Maltreatment in Denmark: Using Self-Report and Administrative Data

This brief report details a series of studies conducted by the National Centre of Psychotraumatology in cooperation with the Danish Centre for Social Research (VIVE) on the nature and extent of child maltreatment (CM) in Denmark. The purpose of this report is to provide national data based on a large sample of young adults who took part in a national survey in 2008/2009 that covered a broad range of adverse childhood and young adulthood experiences, health harming behaviours (e.g., drug and alcohol abuse and criminal behaviours) and health outcomes. This report also intends to highlight how through the application of different statistical modelling techniques and the use of both survey data and administrative data from the Danish nationwide registers provides a more nuanced understanding of childhood adversity and subsequent outcomes across different developmental stages. These findings have important conceptual and methodological implications and may be useful in informing future trauma studies.

Risk Factors for Maltreatment

CM is a product of social, cultural, economic and biological factors that occurs in all societies. It is a leading cause of health inequality and social injustice, with the socioeconomically disadvantaged more at risk. Estimates suggest that at least 18 million children in the Europe will suffer from maltreatment during their childhood [1]. Research on the mechanisms that link adverse experiences in childhood to poor health and social outcomes is critical to identifying targets for intervention. One preventative strategy is to identify key antecedents that place children at greater risk of being maltreated. By firmly establishing these risk factors, it may be possible to develop interventions targeted at those who are most vulnerable, and to intervene at the earliest stage possible. The risk factors that may lead to childhood maltreatment, however, are complex and intertwined. Importantly, the impact of particular risk factors may affect children differently depending on the *type* of maltreatment that occurs. Further, studies have tended to focus on a single risk factor in isolation without controlling for other correlated variables. For example, some studies focus on a narrow range of experiences (usually sexual and physical abuse) which limits knowledge on broader aspects or co-occurring forms of childhood maltreatment.

A number of reviews have been published advocating the application of person-centred approaches such as latent class analysis (LCA) in trauma research in general [2] and CM research specifically [3,4]. These reviews highlight that CM may be more accurately understood in terms of classes, rather than using summative scores and this strategy may lead to an improvement in the accuracy of predictive models [2].

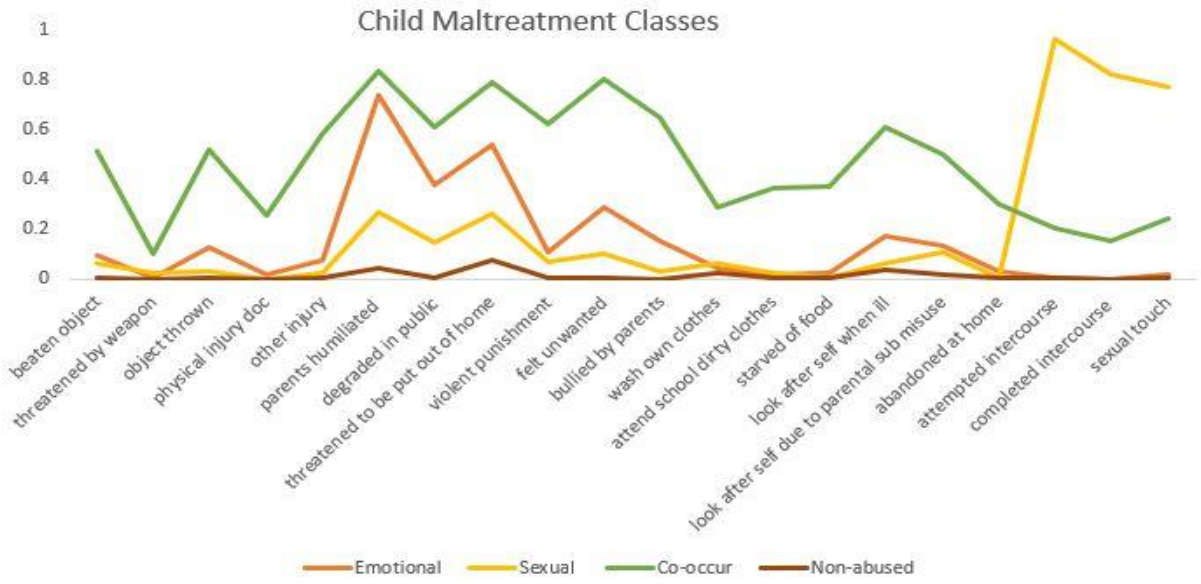
Latent class analyses maximizes the homogeneity within groups, (i.e., individuals within a class would respond similarly to certain maltreatment items) and the heterogeneity between groups, (i.e., individuals between classes will respond differently)

The application of such methods facilitates deeper understanding of how certain risk factors may differentially be associated with CM subgroups. To address this issue the NCP analysed the SFI survey data on self-recalled experiences of CM and found

four typologies[5,6] labelled; no-abuse (N =2570, 86.2%), emotional abuse (N=289, 9.7%), sexual abuse (N=59, 2%), and co-occurring abuse (N=63, 2.1%). The co-occurring abuse class was characterised by high levels of co-occurring physical abuse, emotional abuse, and neglect and moderate levels of sexual abuse experiences. This brought the total amount number of participants who endorsed childhood maltreatment to 13% (N=386). See Figure 1.

The majority of LCA studies have relied on cross-sectional data and cannot infer causal associations. As such, longitudinal investigations are needed to unpack the complex associations between childhood maltreatment and subsequent outcomes. To address this issue, we used data collected from the Danish nationwide registers to allow us to look at risk factors prior to the birth of the child and to examine outcomes across different time periods (e.g., childhood, adolescence, young adulthood).

Figure 1.



Using these abuse typologies, the NCP conducted a range of studies to investigated a range of problems that may be associated with childhood maltreatment in adolescence and young adulthood. These studies were based on information collected from the Danish registers and captured information on parental and familial factors from a period of 4 years prior to the birth of the child continuing through childhood [7,8]. Table 1 highlights these findings.

Table 1 Risk Factors associated with Child Maltreatment

	Emotional	Sexual	Co-occurring
Risk Factors/Correlates from Danish Registers	OR 95% CI	OR 95% CI	OR 95% CI
Family Factors			
Teenage Parent	**1.82 (1.18, 2.81)**	0.94 (0.30, 2.93)	1.39 (0.65, 2.97)
Family Violence	1.38 (0.91, 2.10)	1.11 (0.43, 2.86)	**2.26 (1.21, 4.22)**

Parental Substance Misuse	0.96 (0.59, 1.57)	1.73 (0.69, 4.31)	1.31 (0.64, 2.71)
Family Deprivation	1.32 (0.99,1.75)	1.18 (0.65, 2.14)	**2.83 (1.53, 5.23)**
Family Separation	**2.20 (1.67, 2.90)**	**2.42 (1.35, 4.32)**	**5.54 (2.69, 11.42)**
Parental Mental Illness	**1.71 (1.06, 2.77)**	0.19 (0.02, 2.11)	1.43 (0.61, 3.33)
Individual Factors			
OHC	**2.72 (0.27-0.49**)	**4.00 (0.13-0.47)**	**7.58 (0.06-0.27)**
Mood Disorders[a]	1.00 (0.42-2.35)	1.15 (0.27-2.79)	1.60 (0.19-2.09)
Anxiety Disorders[a]	1.32 (0.41-1.39)	**3.44 (0.13-0.65)**	0.93 (0.37-3.16)
Delusional Disorders[a]	2.30 (0.13-1.40)	**4.90 (0.04-0.98)**	**5.18 (0.04-0.91)**
Musculoskeletal[a]	1.34 (0.53-1.03)	1.17 (0.44-1.66)	1.65 (0.33-1.12)

Note: [a] = age 21; OHC out-of-home care; significant effects in bold;

These studies add valuable population-based data on the role of various parental and family environmental factors that may confer risk for CM. They highlight that, at least between the four years prior to the birth of their child and the first 12 years of the child's life, there were several factors associated with different types of maltreatment. As we can see from Table 1 some risk factors were common across all forms of maltreatment (e.g., family separation and out of home [OHC]) and some are unique to specific types of maltreatment (e.g. being a teenage parent unique to emotional maltreatment).This study[7] highlights that a number of parental characteristics and adverse family environmental factors can confer risk for CM, and that these factors occur in a variety of contexts. Furthermore, in validating the maltreatment typologies against a number of established health conditions[8] when the participants were 21 years of age we can see that the sexual and co-occurring abuse classes conferred approximately a five-fold increase in the risk of delusional disorders and the sexual abuse class were 3 times more likely to have an anxiety disorder.

Outcomes associated with Child Maltreatment

CM has consistently been associated with a variety of adult psychological, social, and physical health outcomes. A substantial number of studies have shown non-specific associations between different types of maltreatment and psychiatric conditions [9]. However, other studies have evidenced specificity in certain types of maltreatment, for example, a recent systematic review[2] found some evidence of differential risk of psychiatric disorders according to different trauma profiles. In light of these inconsistencies within the field, we conducted a series of studies to assess both common and specific outcomes associated with CM using both self-reported data and data from the Danish registers. These findings are presented in Table 2. Firstly, using self-report data from the survey we examined whether the different types of maltreatment were associated with symptoms of attention deficit hyperactivity disorder (ADHD) [10]; alcohol misuse [11]; criminality [12]; intimate partner violence (IPV) [13]; and school problems [14]. These results suggest that symptoms of ADHD were associated with all forms of maltreatment particularly for the co-occurring class. Strong associations for alcohol misuse were also evident across all maltreatment classes particularly for females in the sexual and co-occurring classes. However, it is important to note that the confidence intervals for these classes were very wide and therefore results should be interpreted with caution. Regarding

criminality and school problems the co-occurring maltreatment class fared much worse in these outcomes while those who reported sexual abuse had a higher risk of intimate partner violence in young adulthood. The emotional maltreatment class conferred approximately a 2-fold increase in risk for all outcomes, and whilst the risk estimates were attenuated (in some cases) in comparison to sexual and co-occurring maltreatment classes this finding has important implications for future research as it has been less extensively studied in comparison to other forms of maltreatment.

Table 2. Outcomes associated with Child Maltreatment Typologies

	Emotional	Sexual	Co-occurring
Self-reported Outcomes	OR 95% CI	OR 95% CI	OR 95% CI
ADHD symptoms	**3.09** **2.27-4.20**	**2.07** **1.00-4.29**	**5.08** **2.98-8.66**
Alcohol Misuse (Males)	**3.22** **1.92-5.40**	-	**5.59** **3.03-10.31**
Alcohol Misuse (Females)	**16.51** **5.83-46.82**	**25.53** **8.90-73.21**	**20.54** **5.50-76.74**
Criminality	**3.85** **2.72-5.46**	**2.90** **1.01-10.13**	**5.32** **1.80-10.13**
IPV	**3.01** **1.60-5.66**	**10.90** **5.65-21.01**	**6.49** **5.49-35.53**
School changes	**2.16** **1.39-3.36**	**2.54** **1.40-4.62**	**6.59** **3.28-13.22**
Concentration problems	**3.19** **2.20-4.63**	**4.52** **2.65-7.73**	**8.62** **3.99-18.62**
Special education	**2.01** **1.36-2.97**	1.59 0.89-2.81	**3.32** **1.09-10.06**
ICD-10 Diagnoses (Danish Registers)			
Traumatic Disorders	**2.08** **1.23-3.52**	**2.93** **1.25-6.87**	**2.77** **1.20-6.41**
Psychotic Disorders	**2.96** **1.30-6.77**	**7.86** **2.29-26.84**	**4.27** **1.20-15.26**
Mood Disorders	**1.97** **1.18-3.29**	**3.46** **1.58-7.59**	**3.88** **1.81-8.34**
Substance Misuse	**2.43** **1.73-3.41**	**4.89** **2.74-8.74**	**3.67** **2.04-6.59**
1 Diagnosis	**2.56** **1.73-3.77**	**4.63** **2.30-9.34**	**3.53** **1.73-7.02**
2 Diagnoses	**2.23** **1.27-3.91**	**5.77** **2.49-13.38**	**4.84** **2.09-11.18**
>3 Diagnoses	**2.25** **1.09-4.65**	**3.79** **1.17-12.29**	**4.45** **1.53-12.93**

We then used linked administrative data to examine whether the maltreatment classes differed according to a range of ICD-10 diagnoses (relative to non-abused controls) and examined patterns of comorbidity [15]. Collectively, it is evident that all types of maltreatment were associated with later onset of a range of psychiatric disorders independent of other forms of childhood adversity and

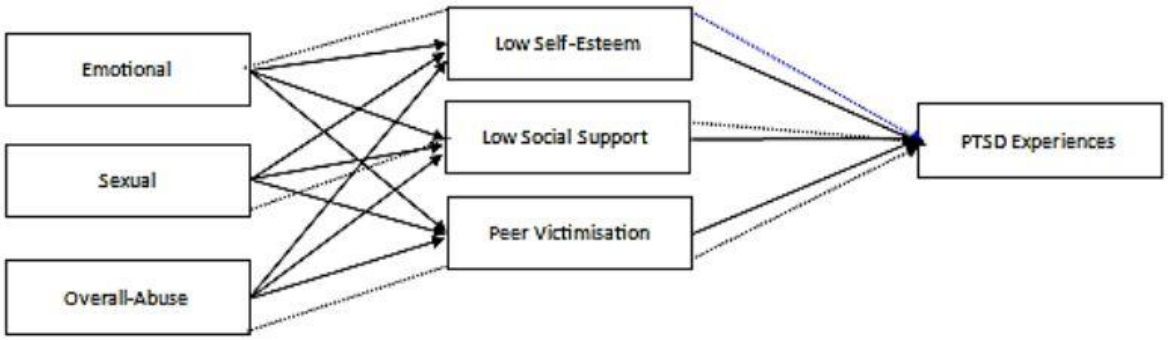
parental diagnosis of a psychiatric condition. The relatively consistent risk estimates and high levels of comorbidity suggest that different types of CM may not induce specific disorders, but rather the co-occurrence of a range of disorders over time. Indeed, this is consistent with emerging transdiagnostic models of psychopathology, which have demonstrated that risk for psychopathology appears to operate at the broad dimension level, rather than the level of specific diagnoses. These findings point to the importance of early intervention for maltreated children using a transdiagnostic approach. The high rates of comorbidity in these individuals also have implications for treatment and stresses the importance of identifying maltreatment early and providing interventions that may offset the risk trajectory for co-occurring psychiatric conditions by targeting difficulties in emotional regulation and promoting adaptive coping strategies.

Mechanisms underlying Child Maltreatment and Adverse Outcomes

The risk and outcomes of CM have been well-documented as seen in the previous studies, however, in order to advance scientific knowledge, we need to focus on moving beyond demonstrating the presence of an effect, to evaluating the mechanisms underlying this effect. This inevitably will facilitate a more comprehensive understanding of "how" and "when" that effect operates and under what conditions. Empirically testing "how" and "when, effects occur, will result in a broader understanding of the processes involved and develop appropriate clinical interventions that can be applied to reduce the negative outcomes of CM. To answer questions about how an effect occurs, we applied the analytical procedure of mediation. This is a process that indicates how CM exerts an influence on particular outcomes through the presence of another mediating variables.

In this series of studies, we explored whether CM was associated with disordered eating (DE) via PTSD symptoms and self-esteem [16] and found PTSD symptoms and self-esteem appeared to differentially mediate the relationship between three classes of CM and DE. For emotional and sexual abuse DE was partially mediated via PTSD symptoms and self-esteem with emotional abuse having a stronger impact on self-esteem and sexual abuse more strongly influencing PTSD symptoms. However, for co-occurring abuse and DE, PTSD and self-esteem fully mediated this association. A second study examined physical health outcomes via health risk behaviours and psychological distress [17]. This study found all three typologies were significantly associated with poorer self-reported physical health. Psychological distress and health risk behaviors partially mediated the relationship between non-abuse, sexual abuse, co-occurring abuse, and physical health, and fully mediated the relationship between emotional abuse and physical health. A third study assessed PTSD symptoms as an outcome, via social support, self-esteem and bullying [18]. Results indicated that the three mediating variables were all statistically significant with low social support exerting the strongest influence in the association between childhood adversity and PTSD experiences. Low self-esteem, however, was only associated with sexual abuse (Figure 2).

Figure 2. The association between Child Maltreatment and PTSD via self-esteem, social support and bullying.



Childhood Adversity More Generally

Data based on a national birth cohort in 1984 and tracked over the first 21 years of their life (n = 54,458).

Empirical evidence suggests that early adverse experiences become embedded into multiple biological systems consequently, many adult health disorders can originate during sensitive periods of development when these systems are more vulnerable to physiological and environmental factors. The following studies assessed the effect of a range of social and psychosocial risk factors on a diagnosis of any endocrine, nutritional, and metabolic (ENM) disorders (19), mood and anxiety disorders [20] and psychotic disorders (21) using linked Danish registry data from a large birth cohort. Psychosocial risk factors are included in Table 3 with the results from the multivariate logistic regression analyses. These studies extend the literature conducted on adult populations by demonstrating that early adverse experiences are associated with poor or poorer health outcomes in young adulthood.

An additional study (22) examined the association between recreational drug use (cannabis only v. polydrug) and psychotic disorders. This analysis was conducted on a large, representative survey of young Danish people aged 24 (N = 4,718). Using self-report measures of lifetime drug use this information was linked to the Danish psychiatric registry system. Multivariate analyses examined the association between drug use (no drug use, cannabis only, cannabis and other drug) and ICD-10 psychotic disorders, while controlling for gender and parental history of psychosis. Compared with no drug use, the use of cannabis only did not increase the risk of psychosis while the odds ratio for cannabis and other drug were statistically significant. The moderating effect of childhood maltreatment was also examined. The findings indicated that psychosis risk may be associated with the cumulative effect of polydrug use and this effect may be moderated by childhood maltreatment.

Table 3. Odds ratios and 95% Confidence Intervals for Psychosocial risks predicting ICD-10 Diagnoses.

	END	Anxiety Disorders	Mood Disorders	Psychotic Disorders
Self-reported Outcomes	OR 95% CI	OR 95% CI	OR 95% CI	OR 95% CI
Gender	**0.80**[1] **0.74-0.86**	**2.29**[1] **2.02-2.54**	**2.99**[1] **2.54-3.52**	0.97[2] 0.79-1.20
Father over 40	0.98 0.82-1.17	0.97 0.77-1.22	0.94 0.67-1.32	1.41 0.95-2.10
Mother over 40	**1.69** **1.15-2.49**	0.81 0.41-1.61	1.25 0.54-2.89	-
Parental unemployment	**1.30** **1.19-1.42**	**1.26** **1.13-1.41**	**1.19** **1.01-1.41**	**1.64** **1.30-2.06**
Family Separation	**1.11** **1.02-1.21**	**1.64** **1.47-1.83**	**1.53** **1.30-1.79**	**1.14** **1.14-1.81**
Father Diagnosis	**1.36** **1.19-1.55**	**1.84** **1.44-2.36**	**1.73** **1.14-2.63**	-
Mother Diagnosis	**1.74** **1.57-1.94**	**2.38** **1.98-2.86**	**2.04** **1.46-2.86**	-
Parental Diagnosis				**3.32** **2.20-5.00**
Urbanicity	**1.23** **1.13-1.32**	**1.17** **1.06-1.29**	0.89 0.77-1.03	**1.42** **1.15-1.75**
Child in Care	**2.36** **1.99-2.80**	**1.47** **1.17-1.85**	1.07 0.73-1.59	**1.96** **1.31-2.91**
Parental Self-harm	-	1.19 0.92-1.54	0.92 0.60-1.42	-
Father Mood/Anx Disorder	-	**1.51** **1.12-2.03**	**1.65** **1.13-2.40**	-
Mother Mood/Anx Disorder	-	**1.55** **1.21-1.97**	**1.97** **1.49-2.62**	-
Cannabis only	-	-	-	0.69[3] 0.12-4.07
Poly-drug	-	-	-	**5.96**[3] **1.71-20.75**

Note; significant effects in bold; OR = odds ratio; 95% CI = 95% confidence intervals; [1]= female; [2] = male; [3] = separate study

The results of these studies show that females were significantly more likely to experience anxiety and mood disorders and less likely to receive a diagnosis of an END disorder. Parental diagnoses of each disorder were associated with offspring diagnosis across all disorders with maternal history of mood and anxiety disorder conferring a higher risk. Children who were placed in OHC (which was used across all studies as a proxy for childhood adversity) was associated with approximately a two-fold increase in risk for all disorders with the exception of a mood disorder diagnosis. Collectively results provide insight into what psychosocial risk factors are important for predicting a number of diagnoses during adolescence and into early adulthood, and what the shared and unique risk factors are for these disorders. Finally, we examined adversity in childhood and adolescence to examine whether adversity conferred a greater risk for PTSD or complex PTSD [23]. Findings indicated that

being female increased the risk for both PTSD and CPTSD classification. Multinomial logistic regression results found that childhood sexual abuse (OR = 4.98) and unemployment status (OR = 4.20) significantly increased risk of CPTSD classification as compared to PTSD. A dose–response relationship was observed between exposure to multiple forms of childhood interpersonal trauma and risk of CPTSD classification, as compared to PTSD.

Conclusions

To conclude, this report aimed to highlight that data linkage studies are a valuable tool in CM research and provide an important opportunity to conduct research using more accurate sources of information which can be used to explore risk and protective factors. In addition, the prospective nature of this combined data facilitates, to some extent, temporal ordering which improves the conclusions based on longer-term follow-up of outcomes for survivors of CM. Further, using previously identified subgroups of CM identified from LCA and linked to administrative data, allows us to investigate how these subgroups may differ in short-term and long-term health and social outcomes which to our knowledge has yet to be done before. Overall, we have reported on the common and unique associations between pre-established risk factors and outcomes associated with different types of CM and that childhood adversity emerges in many different contexts. We have also used a variety of different statistical models to further delineate how these mechanisms and effects occur. These finding highlight important implications for emphasising how a child's early environment can have lasting health effects and highlights the different statistical models and methodologies that can be applied to further study these effects.

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