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**Municipal-Level Variations in Violent Behavior among  
Norwegian Adolescents and its Association to Health-Risk  
Behaviors, Familial Predictors, and Municipal Characteristics**

**A Cross-Sectional Multilevel Study using Ungdata Survey 2014-2016**

Master's thesis in International Social Welfare and Health Policy

Oslo Metropolitan University  
Faculty of Social Sciences

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<https://oda.hioa.no/nb/>

Oslo Metropolitan University

## ABSTRACT

Violence perpetration among adolescents is a global public health and social problem. The prevalence of adolescent violence perpetration in Norway is lower than most countries in Europe. However, the occurrence persisted significantly in less severe forms of perpetration. Few studies have investigated regional variations in prevalence of adolescent violent behavior and its associates. Hence, the study examined municipal-level variations in prevalence of violent behavior among Norwegian adolescents. Based on a socio-ecological model, it investigated the variation in individual factors of health-risk behaviors, familial predictors and municipal-level characteristics associated to variation in violent behavior across municipalities. The study results may be an essential input for policy makers to design area-specific policies and intervention strategies to reduce its prevalence.

The study particularly employed a cross-sectional design and used data from the Ungdata cross national survey 2014-2016. It included adolescents from lower secondary school ( $N=119346$ ) nested within 309 municipalities.

The multilevel (*two-level*) logistic regression result showed that 1.58% of the variability in presence of violence lies between municipalities. The prevalence estimates of violent behavior indicated a small variation between municipalities. All individual and familial factors were associated with the odds of the presence of violent behavior, i.e. alcohol, cigarette, snus, hash, marijuana and cannabis use; depressive symptoms; parental control and parents' financial status. Of municipal-level factors, a high proportion of higher education accomplishment was the only significant factor associated with violent behavior. Municipal factors, to a slight extent, explained the small variation in violent behavior across municipalities, but the individual and familial factors did not explain the differences. The multilevel logistic regression model which included all levels of socio-ecological factors provided the best fit to predict violent behavior.

Considering the small variations in violent behavior across municipalities, the study suggests a greater emphasis on violence prevention focusing on individual characteristics of health-risk behaviors and microsystem influencers of familial predictors than of exosystem, i.e. municipal characteristics. Further studies should examine longitudinal effects and other associates of violent behavior that were not addressed in the study.

*Dedicated to the memory of my dad, who gave me  
unconditional love and support*

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# CHAPTER ONE

## INTRODUCTION

### 1.1. Background

Violence perpetration among adolescents is a global public health and social problem. It has an adverse effect on physical and psychological health and may have negative social consequences (World Health Organization [WHO], 2015; Silva, Nara & Antônio, 2014). Krug et al. (2002) noted that violence perpetration has welfare cost and undermines the fabric of society. It may result in increased health care costs, decreased property value, and disrupted social services (Centers for Disease Control and Prevention [CDC], 2016). For example, Miller, Fisher, & Cohen (2001), as cited in Vakalahi et al. (2015) stated that the cost of adolescent violence for victim-perpetrator in USA is estimated to be over \$6 billion annually.

Violence perpetration among adolescents includes a wide range of violent behaviors (WHO, 2015), such as physical aggression, explosive temper, fighting, threats or attempts to hurt others, use of weapons, intentional destruction of property and vandalism (American Academy of Child and Adolescent Psychiatry [AACAP], 2015). The physical effects of violent behaviors may include less or severe injury (e.g. physical fighting and bullying) and death (e.g. homicide). Contemporary studies and reports have indicated that violent behavior among adolescents, such as physical aggression is one of the most visible forms of violence globally (WHO, 2015).

The prevalence of violent behavior varies across world regions, countries and demographic groups. For example, the prevalence of bullying and physical fighting was 14% between adolescents aged 13–24 in European Union countries and 34.4% in USA (Lowry, 2011). The USA Bureau of Justice Statistics stated that adolescents have the highest rates of violence perpetration compared to other age groups (Morgan & Truman, 2018). According to the WHO (2015) estimate, the prevalence of violence perpetration among adolescents aged 12–17 was 18 persons out of 1000, compared to people aged 25–34 and 35–49, where out of 1000, the numbers come down to 15 and 11 respectively.

A number of scholars, such as Valois, MacDonald, Fischer & Drane, (2002) have argued that violent behavior maybe associated with a complex interplay of risk factors: individual, familial, and environmental, ranging from micro to macro. Individual risk factors embrace the impact of health-risk behaviors on adolescents' behavior, i.e. smoking, alcohol and drug use, and depression—they come under risk factors for non-communicable diseases (WHO, 2015; Valois et al., 2002). Research has documented that violent behavior is associated with health-risk behaviors of smoking, alcohol and drug use, and depression—all which are risk factors for non-communicable diseases (WHO, 2015). According to Global School-based Health Survey (GSHS) (2014), aggressive behavior and bullying were found to be associated with health-risk behaviors. Similarly, WHO (2015) noted that alcohol and substance use can be risk factors for violent behavior. The greater the adolescents are exposed to alcohol, cigarette, and illicit drugs, the more likely they are to engage in violent behavior (Feldman et al., 2015). Familial factors, including but not limited to parental criminality and family structure may also increase the risk for adolescent's involvement in violent behavior. Community and societal factors, such as school environment, other demographic factors, and socioeconomic status have been related to adolescent violent behaviors, but the association should be examined adjusted for confounding factors (Valois et al., 2002).

## **1.2. The Focus of the Study and its Justification**

Norway is a Nordic country in Europe which has put a strong effort to protect children and adolescents from violence, sexual abuse, and bullying. The prevalence of adolescent violence perpetration in Norway is lower than most countries in Europe. However, the prevalence persisted significantly in less severe forms of violence perpetration, such as physical aggression and bullying. Prevention of violence against children and adolescents has been on the political agenda since the 1970s. Norway has committed to respond to the problem by incorporating the prohibition of violence against children in its Children Act 1981. It has also committed to the UN Convention that it would protect children and adolescents from violence and abuse (Schou, Dyb & Graff-Iversen, 2007).

Norway has put special emphasis to reduce prevalence of violence against adolescents, especially children. It developed a national action plan in 2014 on prevention strategy, which includes fostering violence study programs, expanding access to justice for children, involving adolescents thought in policy design and ensuring zero tolerance for bullying in schools (Norwegian Ministry of Children, Equality and Social inclusion [NMCES], 2015).

Local municipalities in Norway have a high degree of autonomy and are the practical implementers of adolescent policy (Bergan, 2018). Hence, examining variations in violent behavior among adolescents on a municipal-level is important because it can be an essential input for policy makers to design area-specific policies and intervention strategies to reduce its prevalence. Few studies, such as Schou et al. (2007) examined regional differences in violent behavior among adolescents in the 18 administrative regions of Norway. To the best of the researcher's knowledge, no study has examined its variation in a smaller administrative unit, i.e., the municipal level. Likewise, studies on individual factors such as health-risk behaviors, familial and municipal factors that correlate to violent behavior among adolescents are limited in Norway. Using Ungdata cross national survey 2014–2016, this study examines municipal-level variation in prevalence of violent behavior among Norwegian adolescents. Drawn from the socio-ecological model (Bronfenbrenner, 1994; WHO, 2002), it investigates the variation of individual factors in health-risk behavior, familial factors and municipal-level characteristics associated to variation in violent behavior across municipalities.

### **1.3. Organization of the Study**

The study is organized into eight chapters. Following the introduction, *Chapter two* discusses associated risk factors that may increase violence perpetration among adolescents, which is a base to construct framework of analysis for the study. Consistent to the study scope, it provides a particular focus on health-risk behaviors, familial factors and municipal-level characteristics. This chapter also discusses the types and prior studies on adolescent violence.

*Chapter three* introduces the framework of analysis for the study. The framework was developed based on the socio-ecological model, notably using the WHO (2002) risk factors of adolescent violence: individual, relationship and societal, and Bronfenbrenner's (1994) ecological model.

*Chapter four* operationalizes the study main concepts aimed to construct measurable factors as related to its objectives. It operationalizes terms, such as adolescent violence, youth, adolescent, and health-risk behaviors. It, finally, discusses the aim and hypothesis of the study.

*Chapter five* introduces the research design and methodology. It discusses the philosophical assumptions, research method and design, types of data, measures, data analysis strategy, reliability and validity issues and ethical considerations of the study. *Chapter six* presents the results and analysis of data. The data gathered from the Ungdata survey are discussed in light of the framework of analysis for the study.

*Chapter seven* summarizes the research findings and interpretations related to the study hypotheses and discuss in view of the framework of analysis. It also discusses the implications of the study. Finally, *Chapter eight* provides concluding remarks related to the study findings and makes suggestions for further research seen in light of the limitations of the study.

## **CHAPTER TWO**

### **RISK FACTORS, TYPES AND PRIOR STUDIES ON ADOLESCENT VIOLENCE**

Many researchers have documented the prevalence and trends of adolescent violence and its risk and protective factors (Krug et al., 2002; Seifert, 2012; WHO, 2015). This study particularly emphasizes the risk factors of violence perpetration among adolescents. According to WHO (2015), “a risk factor is a characteristic that increases the likelihood of a person becoming a victim or perpetrator of violence, or of a place having high rates of youth violence” (p. 13). Risk factors may occur in varied levels, with the vital ones being those occurring during infancy or early childhood. This can significantly increase the likelihood of the involvement in violence later during adolescence and adulthood (WHO, 2015).

As Valois et al. (2002) noted, violent behavior is the result of multifaceted factors ranging from individual to environmental. As such, no single theoretical explanation can explain the complex phenomenon of adolescent violence (Stoff, Breiling, & Maser, 1997). Kashani et al. (1999) stated that this led to recognition of explaining adolescent violence in a multidimensional, psychosocial framework including individual and societal.

Various interrelated factors can increase the risk of violent behavior among adolescents: individual, relationship, community, and societal. These involve dysregulated behavior, childhood trauma, poor parental supervision, health risk behavior, demographic and social changes, and cultural influence (Krug et al., 2002; Seifert, 2012; Valois et al., 2002; WHO, 2015). The international discourse on adolescent violence indicated that an increased number of adolescents experiencing risk factors results in a higher risk of violent behavior (Valois, 2002).

#### **2.1. Associated Risk Factors of Adolescent Violence**

Although the risk factors associated with violent behavior are interrelated, they are discussed separately in the following sections. This chapter will closely discuss health-risk behaviors from individual factors, familial predictors from relationship factors, and municipal characteristics from community and societal factors as they are the focus of this study.

### **2.1.1. Individual Factors**

Individual factors are the first level predictors of adolescent violence. Accordingly, adolescents, compared to other age groups, are risk takers. Risk taking, such as alcohol consumption and substance use may influence adolescents to make impulsive decisions and expose them to numerous negative outcomes (Ralph et al., 2009).

Individual factors include biological, behavioral, and psychological characteristics. This section begins with a thorough discussion on the relationship between health-risk behavior and adolescent violence. It followed by highlighting some of biological and other behavioral and psychological characteristics that are not emphasized in this study.

#### *Health-risk Behavior and Adolescent Violence*

Health-risk behavior is a behavioral factor (Krug et al., 2002; WHO, 2015), and there is evidence that it affects cognitive and physical functioning and could reduce self-control and the ability to process information and assess risks (WHO, 2015). The correlates of health-risk behavior and adolescent violence are examined to discuss the study results in Chapter seven.

Adolescent violence has been found to be associated with health-risk behaviors (Krug et al., 2002; WHO, 2015), among which are smoking, excessive use of alcohol, use of illicit drugs, physical inactivity, and depression (WHO, 2015). Some defining characteristics and the concept of health-risk behavior, including depressive symptoms are emphasised below before discussing the correlates of health-risk behavior and adolescent violence.

Health-risk behavior has been used to describe behaviors with a potentially negative effect on people's health. Studies have shown that violence in adolescence adversely affects physical and psychological health (Suris et al., 2008). According to Glick et al. (2018), health-risk behaviors are recognized as having "direct health implications and may increase the risks of developing chronic dependence and illness in adulthood" (p. 1). Some studies noted that adolescents who engaged in one health-risk behavior are likely to engage in others. This is supported by the problem behavior theory developed by Richard Jessor, which states that an underlying behavioral syndrome causes an adolescent to adopt multiple risk behavior (Suris et al., 2008). Moreover, adolescents engaged in certain health risk behavior are vulnerable to disabling conditions and death in later years (Glick et al., 2018).

Adolescents appear to experience health-risk behavior due to various reasons, one of which is depression. Depressed adolescents tend to engage in risky sexual activity, alcohol and drug use, and other risky behaviors as a coping mechanism for depression, which may lead them to violence perpetration (WHO, 2015). Studies show that depression may increase the risk of violence perpetration. The longitudinal research by Yu et al. (2017) examined the associations between youth depression and later violent outcomes in three countries: the Netherlands, the United Kingdom, and Finland. The results indicated a pattern of subsequent increased risk of violence perpetration in depressive symptoms. Another study on depression and adolescent violence by Bach and Louw (2010) found a significant association between exposure to violent behavior and depression in South Africa.

Merrin et al. (2018) noted that adolescent involvement in violence perpetration could increase the engagement of risky behaviors, such as alcohol and drug use. The National Survey on Drug Use and Health (2006) noted that the probability of violence perpetration increased with the number of drugs used among youth aged 12–17. Adolescents who used an illicit drug in the past year were twice as likely to be involved in violent behavior than youth who did not do so. Wagner (1996) discusses different theoretical models that may explain substance use prediction of violent behavior. One model is Goldstein's *economic necessity hypothesis* which hypothesized "heavy substance users commit violent, criminal acts in order to generate income to support their substance use habit" (Wagner, 1996, p. 377). Another model is the *criminal subculture* model which postulates adolescents' users of illegal substances are drawn into a criminal subculture because their source is illegal. Such kind of repeated interaction with criminal subculture may increase adolescent involvement in violent behavior. The third model is *psychopharmacological model* which postulates that intoxication effects, such as disinhibition, cognitive distortion and attention deficit and associated situational factors would increase adolescent's involvement in violence perpetration (Wagner, 1996).

Swahn's et al. (2011) study shows that early adolescents alcohol use initiation was significantly associated with bullying perpetration. Alcohol and drug usage can impair adolescents' thoughts and behaviors and increase their risk of engaging in violent behaviors (Merrin et al., 2018). WHO (2015) indicated that "alcohol use directly affects cognitive and physical functioning and make particular drinkers more likely to engage in violent behavior"

(p. 15). Moreover, adolescents who consume alcoholic beverages early in life and do so frequently are at an increased risk of involving violence perpetration (Merrin et al., 2018). A longitudinal study on developmental trajectories of alcohol use and violent behavior among African American youths shows that early alcohol use predicted later violent behavior (Xue et al., 2009). Level of alcohol consumption also matters for adolescents to experience violence perpetration, with those who drink frequently of large quantities are at higher risk for showing violent behavior.

Similar to alcohol use, level of cigarette use would predict adolescents experience of violent behavior. According to the Global School-based Student Health Survey (GSHS), violent behavior of bullying was associated to increased cigarette use (WHO, 2015). Matuszka's et al. (2017) examined the relationship between cigarette use and physical aggression. The result, adjusted to gender, shows that addictive cigarette use was associated with elevated physical aggression. The prevalence was higher among addicted tobacco users than in single users or non-smokers. The finding implies that cigarette use is a potential risk factor for physical aggression.

#### *Biological and Other Behavioral and Psychological Factors of Adolescent Violence*

The biological factors may include injuries and complications during pregnancy and delivery. Researchers such as Kandel and Mednick (1991) showed that infancy complications would create neurological damage and increase the risk of violent behavior. A low heart rate is associated with adolescent violence mainly in boys. It may influence them to display violent behavior because it affects their sensation-seeking and risk-taking characteristics. Biological characteristics also comprise age and sex. A study by Merrin, Espelage and Hong (2018) indicated that the prevalence of bullying tends to increase from primary to middle school, decreasing during upper secondary school. Additionally, studies show that bullying appears to be higher among males than females (Merrin, Espelage & Hong, 2018). According to WHO (2015), about “90% of fatal violence is perpetrated by males and 83% of all youth homicide victims are males” (p.15).

Psychological and behavioral predictors may include hyperactivity, impulsiveness, poor behavioral control, and attention problems. Such risk behaviors have been associated with violence in early adulthood. Children with a hyperactivity disorder are likely to experience



aggressive behavior and engage in different forms of physical violence. Such behavioral problems would associate to certain nervous system conditions and their social environment, which can increase the risk of violent behavior. Adolescents, notably males, who showed aggression and severe conduct problem in their childhood period are at an increased risk of violence perpetration and arrest (WHO, 2015). Many studies, including Ttofi, Farrington, Lösel, and Loeber (2011), supported the correlates of early aggression and later violent crime.

A low level of educational performance is one of the behavioral factors found to be associated with violent behavior (Krug et al., 2002; WHO, 2015). This is consistent with the school performance model, which emphasises the effect of low intelligence on adolescents' academic performance in school, which may increase their involvement in delinquent activities during later ages (WHO, 2015).

### **2.1.2. Relationship Factors**

Relationship factors are the second level predictors of adolescent violence. Interpersonal relations were found to be strongly associated with violent behavior. The influence of family is high during childhood in addition to peer influence during adolescence. Moreover, poor parental supervision and physical punishment increase the risk of later engagement in violence among adolescents. Parental conflict, poor attachment between parents and children, adolescents of single-parent households, and low level of family cohesion strongly predict the exposure to violence perpetration (Krug et al., 2002; WHO, 2015).

Likewise, adolescence is a transitional stage where attachment among peers is high. It is also a stage to enjoy independence (WHO, 2015), including spending less time with family and more time with peers (Merrin et al., 2018). Adolescents who have friends that are delinquent and addicted to alcohol and drugs, tend to display violent behavior (Krug et al., 2002; WHO, 2015). Parents' involvement in children's development plays a significant role in influencing adolescents exposure to violent behavior (WHO, 2015). Ralph et al. (2009) stated that adolescents may learn to experience risk behaviors by observing their parents' behaviors. As such, conflicts existing within the family have been found to contribute to adolescent engagement in risky behaviors. Many scholars, such as Ralph et al. (2009), stressed that family structure correlates with the exposure to health-risk behavior, which may lead to violent

behavior. For example, adolescents in single-parent families have been found to engage in substance abuse compared to those from intact families (WHO, 2015).

According to Ralph et al. (2009), “the family is considered adolescents most powerful influence, as its effect continues long after leaving home” (p. 392). The nature of the connection between adolescents and their parents affects their involvement in risky behaviors. Studies indicate that parental monitoring is correlated with adolescent risk-taking behavior (Ralph et al., 2009). WHO (2015) also noted that children who grow up in less parental supervision tend to be involved in violence perpetration as opposed to children who grow up under proper supervision. Ralph et al. (2009) supports that less parental monitoring is associated with increased participation in antisocial activities, sexual risk taking, and increased substance use or abuse. Consistent with this, Merrin et al. (2018), for example, indicated that many parents of bullies were found to be emotionally distant from their children, which may affect their development.

Among the relationship factors, the study has a particular focus on familial level factors, such as parental control that will further be elaborated in Chapter four and five.

### **2.1.3. Community and Societal Factors**

Community and societal factors are the third and fourth level predictors of adolescent violence respectively. They are macro level factors and help to explain why certain ecological characteristics account for violence perpetration (Pratt, & Cullen, 2005). Young people’s social environment, such as communities influencing their families, the nature of their peer groups, and the way they may be exposed to situations and can lead to violence (Krug et al., 2002; WHO, 2015). For example, adolescents living in urban areas are more likely to show violent behavior than those in rural areas (Krug et al., 2002; WHO, 2015). A study by WHO (2015) noted that “children who knew many adult criminals were more likely to engage in violent behavior by the age of 18 years than those who did not” (p. 17). Children who grow up in neighbourhoods that exhibit criminal behaviors have been identified in many studies as being at the risk of adolescent violence. Exposure to an unhealthy environment and deviant behaviors in their neighbourhood, including criminal acts, drug dealing, or abuse, gangs, and problems related to housing are predictors of adolescent violence (WHO, 2015).

Another community factor is social integration. Adolescents living in places that lack social integration are likely to perform poorly in their education, thereby leading to violent behavior (Krug et al., 2002; WHO, 2015). The school environment is an extremely influential factor of aggression among adolescents (Kashani et al., 1999) because they spend a considerable duration in school (Merrin et al., 2018). This includes teacher hostility, lack of classroom rules, regulation and management, and overcrowded schools. Adolescents in overcrowded schools are more likely to show violent behavior than those in uncrowded schools (Kashani et al., 1999). Furthermore, Merrin et al. (2018) noted that an unsafe school environment is linked to adolescent violence perpetration. For example, adolescents who think their school environment is unsafe because of bullying may reinforce violent behaviors for self-protection. According to Glew, Fan, Katon, and Rivara as cited in Merrin et al. (2008) “adolescents identified as bullies were significantly more likely to report feeling unsafe at school than their peers who were uninvolved in bullying” (p. 45).

In light of the above, societal factors are not causal but are associated with other contributing factors. This includes demographic and social changes, income inequality, political structure, and cultural influence, which may create a conducive environment for the exposure to adolescent violence. Studies have also found that ease of access to firearms is associated with adolescent violence. Adolescents carrying weapons result in violence perpetration compared to those with no weapons. In addition, adolescents living in neighbourhoods characterised by poverty are more likely to show violent behavior (Krug et al., 2002; WHO, 2015). Seifert (2012) stressed that “many poor families live in violent neighbourhoods, and the exposure to violence can adversely affect both parents and children” (p. 107).

Among the community and societal factors, this study examines the association between adolescent violence and some of municipal-level characteristics, such as urban settlement.

## **2.2. Types of Violence**

Violence can be classified based on purpose and target. When categorised by *purpose*, violence can be instrumental, situational, or predatory. Instrumental violence is used to realise a certain goal that can be power, money, or resource. Situation violence often results in an

impulsive situation when an emotional upsurge occurs (Seifert, 2012). For example, it could occur when “youth with poor coping skills may become over-whelmed when faced with even minor stressors. Without other means of self-regulation, they may use aggression to vent emotions” (Seifert, 2012, p.35). Situational violence generally appears with the presence of other risk factors, such as individual, familial, and environmental. Predatory violence is also known as psychopathic violence that occurs when an adolescent has an intention to harm another person or colleague with a goal to exercise domination and control and cause pain and suffering (Seifert, 2012).

The WHO developed a typology of violence after declaring violence as a leading public health problem in its 1996 resolution. The typology characterised different types of violence in a comprehensive way compared to existing definitions. It has been classified into three general categories, as presented in Figure 2.1, based on *target*: self-directed, interpersonal, and collective violence. Self-directed violence is divided into suicidal behavior and self-abuse. Suicidal behavior involves the behavior of attempted suicide and suicidal thoughts, while self-abuse includes self-harm and self-mutilation (WHO, 2002).

The second type, interpersonal violence, is classified into family and intimate partner violence and community violence. The former mostly occurs among family members and intimate partners mainly reported at home, including child and elderly abuse. The latter occurs between unrelated persons and generally takes place outside the home. Some examples are rape, other forms of sexual assault, and violence in school, prison, and the workplace. The third type, collective violence, can be divided into social, political, and economic. Social violence occurs by groups of individuals or states to achieve a particular motive, which can be social agenda such as terrorism, hate crimes, and mob violence. Moreover, political violence involves war, state violence, and similar acts that are perpetuated by large groups. Economic violence is group violence aiming to obtain economic benefit (WHO, 2002).

This study particularly focuses on interpersonal violence, mostly community violence. It does not cover suicidal behavior, self-harm, or collective violence described in WHO (2002).

## Types of violence

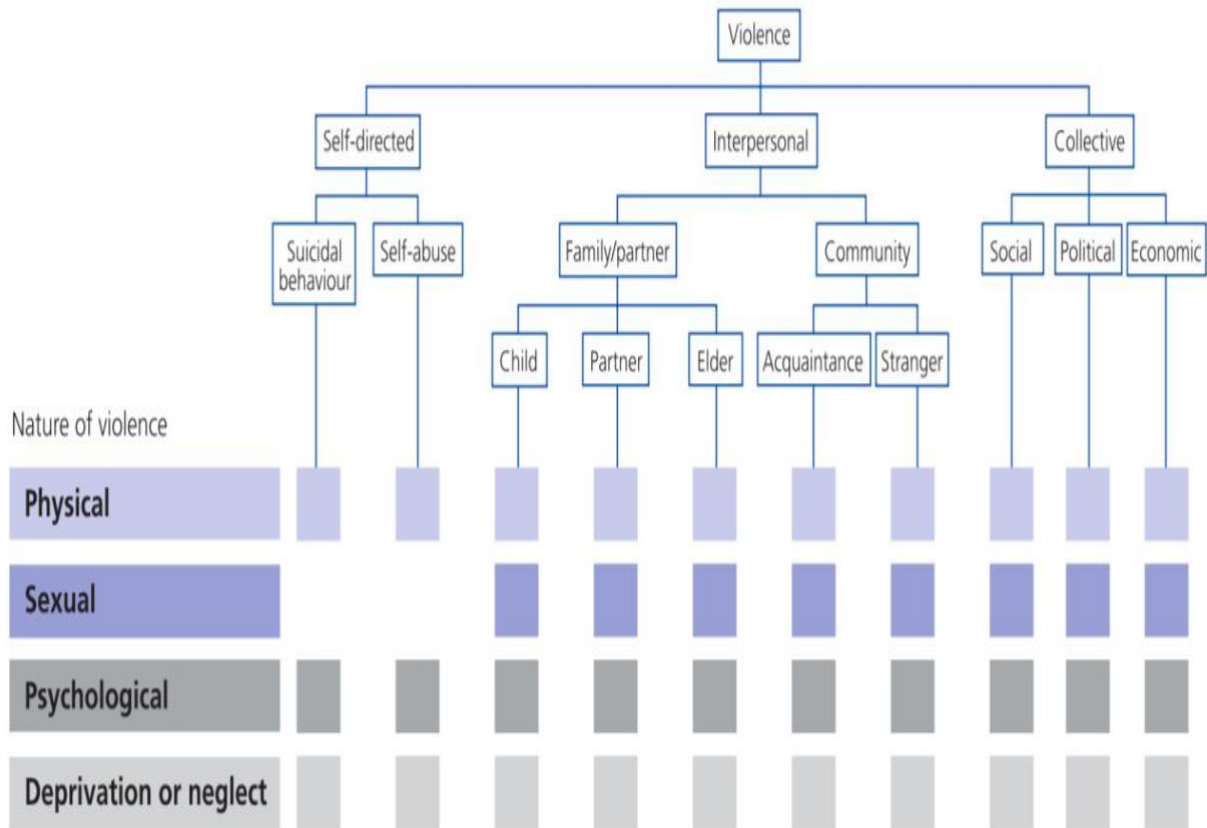


Figure 2. 1 A Typology of Violence

Source: Adopted from WHO, 2002, p. 7

### 2.3. Prior Studies on Adolescent Violence in Norway

There are few studies that examined regional difference of adolescent violence perpetration in Norway. Most prior studies among Norwegian adolescents were on violent victimisation, but not perpetration which is the main focus of this study. As noted by Strøm (2014), when it comes to the prevalence estimates of both victimisation and perpetration, previous studies have varied by age and geographical area.

The following provides a brief discussion of studies on violence in the form of victimisation and perpetration. Among them are Schou et al (2007), Haaland (2000) and Nordfjærn, Dahl & Flemmen (2013).

Schou et al (2007) aimed to estimate the prevalence of exposure to violence and sexual abuse among Norwegian 15 –16-year old. It examines the association of sexual abuse and violence as related to individual, geographic and socioeconomic predictors. The findings showed that 22% of the respondents were exposed to violence in 2007. Social and individual factors of low socio-economic family background, living with single-parent, regular alcohol use, being bullied at school, low educational achievement, poor health and mental distress were significantly associated with exposure to violence and sexual abuse.

Haaland (2000) study aimed to examine problematic behavior among youth, notably experiences of violence as related to the use of illicit drugs. It was based on data from foundation-course pupils at upper secondary schools in Oslo, Drammen, Kristiansand and Stavanger. The study found out that 30% of adolescents were reported to have been exposed to violent acts in 2000. Almost half of the victims reported that they had visible marks or scars on their body related of violence. Adolescents with an immigrant background were slightly less involved in violent acts than those with a Norwegian background. However, adolescents of immigrant background who showed violent behaviour frequently engaged and were involved in serious types of violence. Violent behavior and its exposure were associated to the use of intoxicating substances. The strong association noticed between experience of violence and use of illegal intoxicants.

Nordfjærn, Dahl & Flemmen (2013) study deals with social influence, health variables and criminal behaviors associated with substance use among rural Norwegian adolescents. It was based on data from Ungdata study. The cross-sectional survey findings showed that social status of deviant behaviors and involvements of criminal act were associated with alcohol and substance use.

## **2.4. Summary**

The factors related to violent behavior are complex and interrelated. The individual and the broader environmental (familial and social) factors are linked with exposure to adolescent violence. This implies that violent behavior requires a holistic approach to reduce its prevalence. In the next chapter, the individual and environmental risk factors are discussed in the context of the study. Based on this discussion, the framework for the study is developed.

## CHAPTER THREE

### SOCIO-ECOLOGICAL MODEL AS FRAMEWORK OF ANALYSIS

The framework that guides the study analysis was drawn from a socio-ecological model. The study applied the social-ecological model to examine individual-, familial- and municipal-level associates of violent behavior that may explain variations in violent behavior among Norwegian adolescents between municipalities.

#### 3.1. The Socio-Ecological Model

The prevention of violence among adolescents requires understanding its causal factors. The socio-ecological model has commonly been used to explore factors promoting or impeding violent behavior among adolescents, such as bullying (Barboza et al., 2009; Merrin, Espelage, & Hong, 2018). It is widely used in public health research and practice (Golden, McLeroy, Green, Earp, & Lieberman, 2015), and indicates “attitudes and behaviors of an individual are influenced by a complex interplay between individuals and the social environment they are embedded in” (Merrin et al., 2018, p. 43). The socio-ecological model is a theory-based framework (Unicef, n.d.) and an illustration of the dynamic interactions between individuals, groups, and the social environment. System thinking characteristics are core to the social-ecological model, which examines the interaction of systems within the environment that form a whole. Moreover, Urie Bronfenbrenner’s Ecological Systems Theory (1979) and Ecological Framework for human development (1992) reconceptualised the social-ecological model by explaining how individuals are to influence and be influenced by people and organizations with whom they interact, available resources and institutions, and societal norms and rules (Golden et al., 2015).

Bronfenbrenner’s framework is one of the most influential contributors to socio-ecological thinking, which has been extensively applied in several types of health research (Eriksson, Ghazinour, & Hammarström, 2018). In his model, behavior is influenced by multiple levels of influence, i.e. psychosocial environmental (Golden et al., 2015). Bronfenbrenner’s model analytically divides the social environment into different categories, aiming to provide a systemic focus on the different levels and types of social influence. He perceived environmental

influences as micro, meso, exo, and macrosystem levels (McLeroy et al., 1988). According to McLeroy et al., (1988),

The microsystem refers to face-to-face influences in specific settings, such as interactions within one's immediate family, informal social networks, or work groups. The mesosystem refers to the interrelations among the various settings in which the individual is involved. These may include family, school, peer groups, and church. The mesosystem is the system of microsystems. The exosystem refers to forces within the larger social system in which the individual is embedded. Examples might include unemployment rates which effect economic stability. The macrosystem refers to cultural beliefs and values that influence both the microsystem and the macrosystem (p. 354) (Figure 3.1).

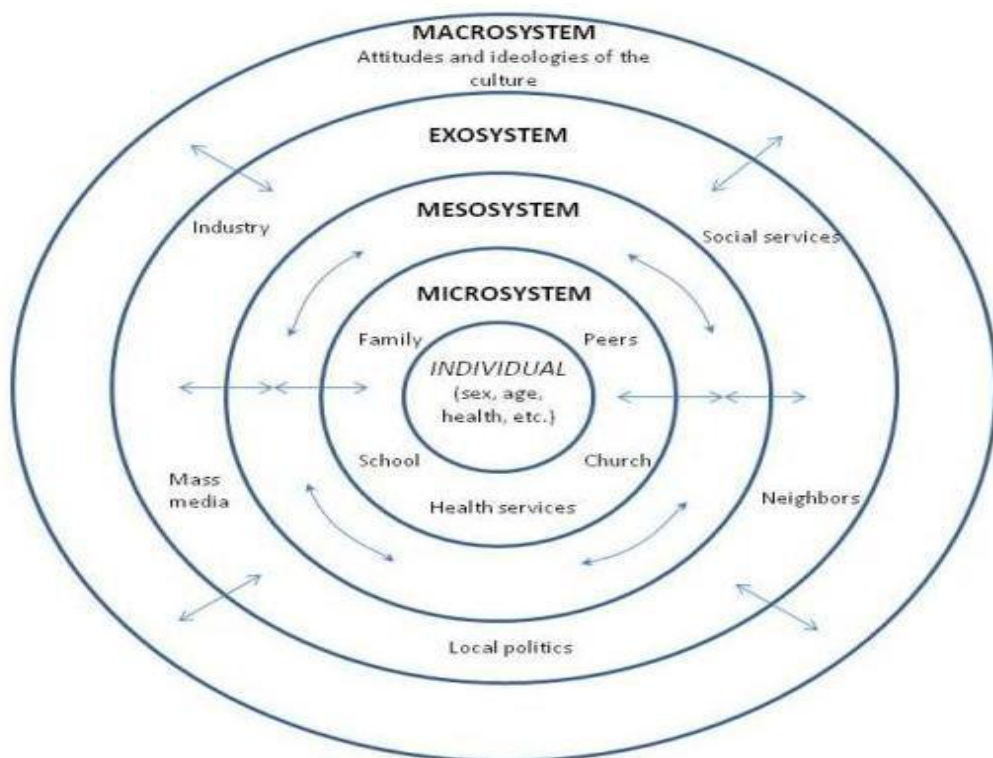


Figure 3. 1 Bronfenbrenner's Socio-ecological Model

Source: Adopted from Mash & Wolfe, 2019



Bronfenbrenner (1994) stated that a microsystem influence involves characteristics of ecological influence which can be controlled by individuals. It comprises interaction between the adolescents and their immediate surrounding environment, such as parents. Wernert (2017) conceptualises that the microsystem influence includes family, friends, and school, which are powerful influences on adolescent surroundings. As such, adolescents have the closest interactions in an ongoing base with their families, friends, and schools. Within this system, violent behavior, such as bullying relationships, are often formed. The bully-victim relationship is the most influential to a bullying relationship. As Bronfenbrenner (2005) noted, the key concept in the microsystem is a bi-directional influence, i.e. a two directional influence. The assumption here, for example, using a parent-adolescent relationship, parental behavior, and beliefs may affect the behavior of adolescents and vice versa. Such bi-directional influence can also occur between each layer of Bronfenbrenner's model.

In the mesosystem, family, school, and peer groups are examined in the context of the different roles that adolescents play in microsystem. For example, an adolescent would have a religious role as well as that of a student, son, and friend. The interaction between these roles and systems form the meso-system. For example, violent behaviors, such as aggression, can be defined differently among the school system, parents, peers, and religious institutions. This can create issues as it leads to inconsistency on the perception of adolescents. The mesosystem, in general, can be understood beyond a two-way interaction, including parent to school administrators, parent to religious institutions etc. (Wernert, 2017; Bronfenbrenner, 1994).

In the ecosystem, adolescents have an indirect relationship or rare interaction consisting of the larger social system, for example, the influence of an unsafe neighbourhood environment on adolescent violence (Wernert, 2017; Bronfenbrenner, 1994). Hong and Espelage (2012) noted that an unsafe neighbourhood environment may directly or indirectly influence bullying behavior among adolescents.

Furthermore, the macro-system emphasises the influence of cultural patterns and other macro level influences, including religion, social values and norms, customs, lifestyle, and material resources (Bronfenbrenner, 2005; Bronfenbrenner, 1994; Wernert, 2017). According to Bronfenbrenner (1994), it is considered as a societal blueprint for a particular culture that has a significant impact on individual behavior.

The chrono-system summed up by Bronfenbrenner (1994) has broadened the socio-ecological model. The core idea of the chrono-system is that change over *time* in the social environment in which persons live matters, which is consistent with the changes in their characteristics. According to Bronfenbrenner (2005), the presumption is that the process of the human environment cannot be understood without the effect of time, including but not limited to, age. The chrono-system enables the identification of the impact of prior lived experience on subsequent development. Such experiences, as noted in Bronfenbrenner (2005), “may have their origins either in the external environment (e.g., the birth of sibling) or within the organism (e.g., the first menstruation)” (p. 83). Hong and Espelage (2012) identified some factors that affect bullying behavior: the transition from primary to higher education, family income, and stable to unstable environment or vice versa.

Another good example of the chrono-system is discussed in Elder’s (1974) study on *children on the great depression*. His study compared two groups of families notably developmental outcome through childhood, adolescence, and adulthood differing based on loss of income due to the 1930s Great Depression, exceeding or falling short of 35 percent (Bronfenbrenner, 1994). The result paradoxically explored that adolescents “who were teenagers during the depression years, the families’ economic deprivation appeared to have a salutary effect on their subsequent development and behavior, especially in the middle class” (Bronfenbrenner, 1994, p. 40). As a result of the deprivation, adolescents were engaged in different roles and responsibilities to support their families’ economic needs (Bronfenbrenner, 1994).

Considering the above discussion, the socio-ecological model suggests that violent behavior does not occur in isolation and it is important to recognise the environmental influences of micro, meso, exo, macro, and chronosystems on adolescents. For the purpose of this study, the micro and exo systems, within the frame of *individual, relationship and community and societal* factors are used as the organising concepts for the framework of analysis. The study does not address the macro, meso and chrono systems that emphasize cross level-interactions of systems, ideological factors and change in the social environment.

### 3.2. Application of the Socio-Ecological Model and Rationale

The ecological model is recognised as an essential model, which has been used as a framework to guide public-health research (Strøm, 2014). The socio-ecological model analysis has contemporarily been used to study adolescent violence (Espelage & Swearer, 2003), and many scholars have recommended an ecological perspective to study the causality and correlates of adolescent violence perpetration (Shaffer-McCuish, 2014).

The model has been redefined to better fit for public health research (Simons-Morton et al., 2011), for example, WHO's (2002) ecological model to help understand the multifaceted nature of violence and its causalities as related to the interaction among individual, relationship, community, and societal factors (Figure 3.2).

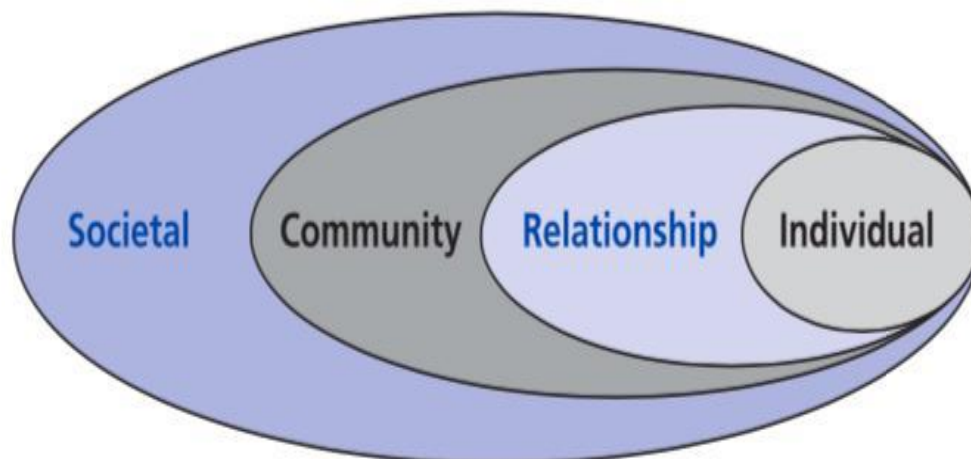


Figure 3.2 WHO's Ecological model for understanding violence

*Source:* Adopted from WHO, 2002, p. 12

The rationale behind choosing the socio-ecological model is that it provides comprehensive scrutiny on the associates between violent behavior and health risk behavior. As stated in Chapter two, these correlates are discussed in individual factors. Consistent with the purpose of this study, the social-ecological model also helps to examine familial- and municipal-level factors for violent behavior. It can further help examine the variation in municipal-level factors and their association to variation in violent behavior across

municipalities. The predictors of municipal-level factors indicated in Chapter four are categorized in the community and societal level factors.

The socio-ecological model can holistically examine factors influencing violent behavior among adolescents, assuming that the individual and environmental factors are mutually inclusive or reciprocal. For this study, three factors—individual, relationship, and community and societal (WHO, 2002)—based on Bronfenbrenner’s model are used to analyse the study findings. The first factor, *individual*, correlates violent and health risk behaviors. The second factor, *relationship*, associates familial factors and violent behaviors. The third factor, *community and societal*, correlates municipal-level factors and violent behaviors (Figure 3.3).

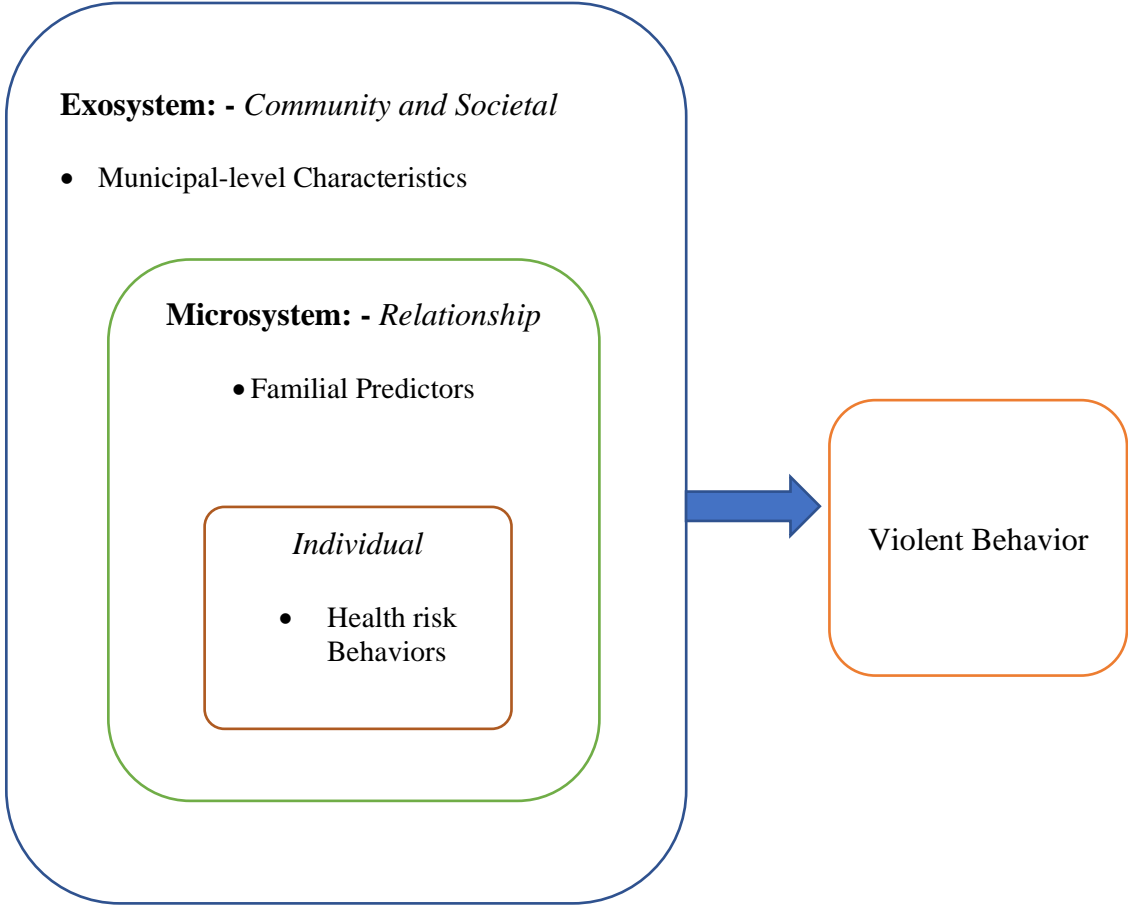


Figure 3. 3 The Framework of Analysis for the Study

Based on the drawn framework of analysis, the study measures will be constructed in the following chapter.

## CHAPTER FOUR

### AIM AND HYPOTHESIS OF THE STUDY

The study examines municipal-level variations in prevalence of violent behavior among Norwegian adolescents and its association to individual-level factors of health-risk behaviors, familial predictors, and municipal-level characteristics. The purpose is to examine the various individual level risk factors associated with violent behavior within the context of environmental input.

This chapter has two sections. The first section defines and operationalizes concepts and measures that are used in the study, followed by discussing the study hypotheses.

#### 4.1 Operational Definitions

There are many possible ways to define adolescent violence. WHO (2005) defines *adolescent violence* as “violence that occurs among individuals aged 10–29 years who are unrelated and who may or may not know each other, and generally takes place outside of the home” (p. 5). It includes, but not limited to physical aggression, bullying, sexual violence, and rule-breaking. This study has a specific focus on adolescent *violence perpetration*, which includes a wide range of violent behaviors “that can start early and continue into young adulthood” (CDC, 2010, p. 1). Violent behavior is understood in this study as harmful behaviors which comprises shoplifting, physical aggression, vandalism, stealing, bullying and digital bullying. It does not cover serious forms of violent behaviors, such as rape and homicide (see Chapter 5).

The study used the words ‘youth’ and ‘adolescent’ interchangeably. It refers ‘youth’ as a person between ages of 10–29 years. The WHO defines adolescents as individuals between ages 10-19 years—they are in a rapid life phase which has a particular health and developmental needs, learn to manage emotions, and acquire characteristics that would be important to develop adult attributes (WHO, 2019). WHO (n.d.) notes that the terms youth and adolescence can be used interchangeably but they may be defined differently in different countries, with “adolescence”, for example, starting at 12 years or “youth” continuing into the mid-30s. Such definitional variation may result from demographic, economic and socio-cultural factors (UN, 2008). For the purpose of this study, adolescents refer individuals between the ages of 10–29.

Another core concept is health-risk behavior. In this study, health-risk behaviors are cigarette, alcohol, snus, hash, marijuana and cannabis use; and depression. They are measured using closed ended questions presented in Chapter five. Among the health risk behaviors, the meaning of snus and depression needs to be operationalized. Depression is a subjective experience and hence, most of its symptoms do not appear to have a universalized meaning (Yip, 2004). Likewise, snus is different from other smokeless tobacco products and is not a widely used product globally (Maria et al., 2016).

Snus is a smokeless tobacco product which is typically used in Sweden and Norway. It is a saturated, ground tobacco orally taken behind the upper lip. The study characterized snus use as health-risk behavior because it contains harmful substances, such as cancer-causing tobacco specific nitrosamines (TSNAs) (Foulds et al., 2003). Smokeless tobacco can cause serious health complication, ranging from mouth disease and cardio-vascular complication, to cancer. It contains highly addictive chemical, such as nicotine (CDC, 2018). According to the Norwegian Institute of Public Health [NIPH] (2014), contemporary research evidence supports that snus may worsen cancer as in smokeless tobacco, including Scandinavian snus contains chemicals like carcinogenic tobacco-specific nitrosamines (TSNA) that may contribute cancer development.

The study has used the term depression which is described as a common mental disorder among adolescents. It is characterized by a depressed mood including but not limited to loss of interest, low energy, feeling of guilt, unstable sleep, and poor concentration (WHO, 2012). It may range from a mild condition, bordering on normality, to severe psychotic depression which is accompanied by hallucinations and delusions (Barboza et al., 2012). Depression can be understood into two categories based on severity of symptoms that are *mild* and *severe*. People with mild depression can have some form of restraint to continue social activities, familial and work responsibilities, but would not cease to function completely. People with severe depression are often not be able to continue their individual, familial, and social responsibilities (Marcus et al., 2012). As presented in Chapter five, this study understood depression as *depressive symptoms* based on the depressive mood inventory, which includes feeling of nervous, scared or anxiety, dizziness and exhaustion.

In this study, the *microsystem* components are familial predictors of parental control and financial status. The *exosystem* components are municipal characteristics of centrality, the

proportion of immigrants and Norwegian-born to immigrant parents, and proportion of higher education accomplishment.

#### **4.2 Hypotheses of the study**

The social-ecological model suggests adolescent behaviours are associated with the interplay of individual, familial, and environmental factors (WHO, 2002). Hence, studies on violent behaviour among adolescents must consider the effect of individual factors within the context of environmental input (Valois et al., 2002). Prior studies in Norway was limited to examine individual (health-risk behaviors) and environmental (familial and municipal characteristics) associates of violent behavior among adolescents. In addition, to the best of the researcher's knowledge no study has examined variations in violent behavior among adolescents across municipalities. To address this research gap, the study formulated three hypotheses. Based on Schou et al. (2007) study findings of regional difference in prevalence of violent behavior between the 18 administrative regions of Norway, the first hypothesis assumes such variation may exist across municipalities.

*Hypothesis 1:* The prevalence of violent behavior among Norwegian adolescents varies across municipalities

Consistent to previous study findings, such as Merrin et al. (2018); Matuszka et al. (2017); Silva et al. (2014); Grøtvedt et al. (2012); Carlyle & Steinman (2007), the second hypothesis postulates the prevalence of violent behavior would be associated with individual-familial- and municipal-level factors, particularly:

*Hypothesis 2a:* the prevalence of violent behavior would be associated with individual-level factors of health-risk behaviors.

*Hypothesis 2b:* the prevalence of violent behavior would be associated with familial-level predictors of parental control and parent's financial status.

*Hypothesis 2c:* the prevalence of violent behavior would be associated with municipal-level characteristics of centrality, proportion of immigrants and Norwegian-born to immigrant parents and proportion of higher education accomplishment.

The third hypothesis assumes municipal-level variation in the prevalence of violent behavior may be explained by individual- and familial-level predictors and municipal characteristics, notably:

*Hypothesis 3a:* municipal-level variation in the prevalence of violent behavior would be explained by individual- and familial-level factors.

*Hypothesis 3b:* municipal-level variation in the prevalence of violent behavior would be explained by municipal-level characteristics.

Consistent to the study hypothesises, how the study was designed and what methods were used to analyze the data appear in the following chapter.



## **CHAPTER FIVE**

### **RESEARCH DESIGN AND METHODOLOGY**

This chapter discusses the research design and methodology for the study. A research design is a blueprint for the collection, measurement and analysis of data. It constitutes a methodology of assumptions, principles and procedures to systematically address a research problem (Kothari, 2004). The chapter starts by highlighting the underlying philosophical assumption of the study.

#### **5.1 Philosophical Assumption**

The study adhered to the post-positivist paradigm for studying knowledge and reality. This paradigm stresses objective understanding of a research problem. It is a value-free—free of subjective bias— follows linear methodological procedures to interpret quantifiable data. It supports the use of a quantitative method to conduct research (Creswell, 2002). The post-positivism denotes “to the thinking after positivism, challenging the traditional notion of the absolute truth of knowledge and recognizing that we cannot be absolute about our claims of knowledge when studying the behaviour and actions of humans” (Creswell, 2002, p. 7). Instead, it assumes that causes may determine outcome so that it reflects an essence to scrutinize associates and causalities, e.g. correlational and experimental study. The post-positivist paradigm is reductionistic that it has the aim to examine social reality by reducing theories into small ideas which should be tested, notably including hypothesis and research questions. Studies in this paradigm needs a careful measurement of reality that exists *out there* in the world. Hence, it requires numeric measures and interpretation to study the behaviors of individuals. The post-positivist research starts with a theory followed by formulating hypothesis that can either support or refute the theory (Creswell, 2002).

The epistemological assumption of the study was to examine hypothesized questions and associations detached from subjective bias, and the ontological assumption of understanding objective meanings to explain variation in the prevalence of violent behavior across municipalities and its associated factors among Norwegian adolescents.

## 5.2 Method and Design

The study used a quantitative method which is a procedure for collecting and analyzing numerical data (Bryman, 2012), “as exhibiting a view of the relationship between theory and research as deductive and a predilection for a natural science approach (and of positivism in particular), and as having an objectivist conception of social reality” (Bryman, 2012, p. 160). According to Bryman (2012), the process of quantitative research is (1) identification of theory (2) hypothesis is deduced from theory (3) research design (4) devise measures of concepts (5) select research site and subject (6) administer research instruments (7) process and analyse data and (8) write findings, discussion and conclusion (Figure 5.1).

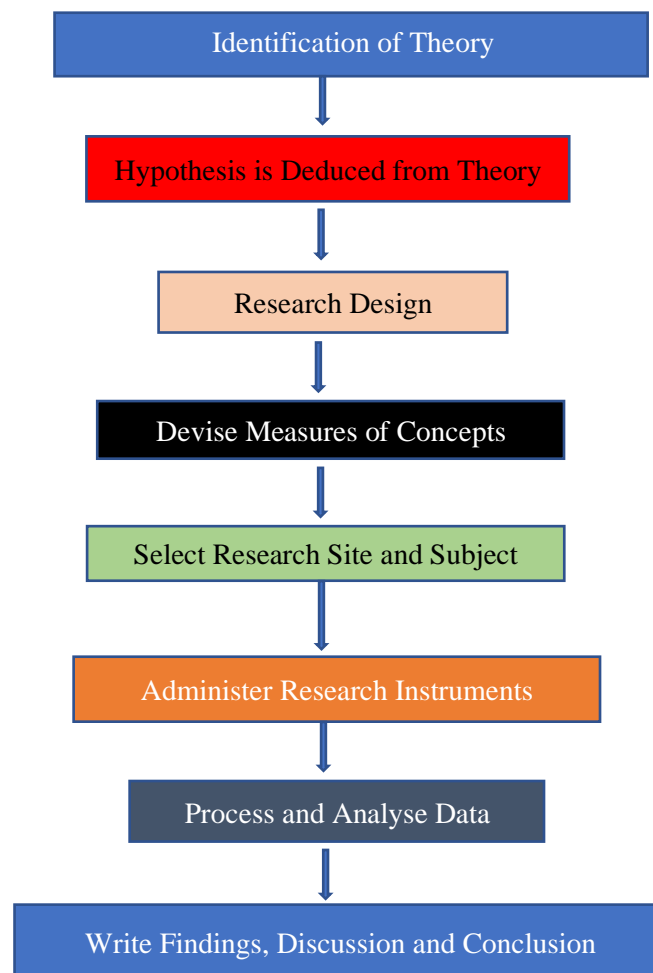


Figure 5. 1 The Process of Quantitative Method

*Source:* Adapted from Bryman, 2012

The study used cross-sectional design for investigating variation and correlational patterns in the data. Bryman (2012) noted that a cross-sectional design is often called a survey design and examines more than two cases. It investigates variation in variables included in a study and requires a larger sample size. A cross-sectional design includes more than one case because it has a particular interest in variation and association. The variation may be between individuals, families, organizations, community or countries. The variation in this study was on individual-and municipal- level in the prevalence of violent behaviour.

A cross-sectional design examines cases at a single point in time, in contrast to, for example, experimental and longitudinal studies, which examine measures at multiple time points. In this design, analytical techniques implying the passage of time are not applied. Another characteristic of this design is the need to use quantifiable data and systematic and consistent measures. The purpose is to establish variation between cases and then to examine associations between variables. The cross-sectional design is often used to examine correlational analysis between and among variables but not aimed to scrutinize certain causal inferences. It is also economically feasible to collect large samples (Bryman, 2012), such as Ungdata. Large samples provide statistical power for conducting a specialized analysis of multilevel regression (Bryman, 2012).

### **5.3 Type of Data**

The study used Ungdata cross-national survey, a comprehensive, quality assured, standardized system designed to conduct surveys on adolescents of lower and upper secondary education in Norway at the municipality level (Ungdata, 2018). This study particularly focused on lower secondary students. Ungdata is a repeated online survey that have been conducted in many secondary schools all over the country (Kleppang et al., 2018). It focuses particularly on adolescent health and well-being and aims to develop preventive measures and fostering public health intervention among adolescents (Ungdata, 2018). Ungdata (2018) noted that:

Ungdata cover various aspects of young people's lives, e.g. relationship with parents and friends, leisure activities, health issues, local environment, well-being, and school issues. The surveys also include questions about tobacco and drug use, and participation in various forms of antisocial behavior such as violence and bullying (p. 1).

NOVA is responsible for the implementation of Ungdata survey, in collaboration with KoRus of Vest Bergen, Vest Stavanger, MidNorway, East, South, Nord, and Oslo. Ungdata is an online survey, which almost all Norwegian municipalities have participated in, since its beginning in 2010. The survey collects population data of the participating municipalities and the participation is free of charge for the municipalities. Until 2015, the data collection was funded by the Norwegian Directorate of Health, Norwegian Directorate of Health, Ministry of Children, Equality and Social Inclusion, Ministry of Justice and Public Security, and Ministry of Education and Research. But since 2015, it has started to be financed through ‘Statsbudsjettet’, i.e., the state budget (Ungdata, 2018; Frøyland, 2017).

The response rate in Ungdata differs between participating municipalities. The overall participation rate for lower secondary school for the years 2014-2016 was 82%. The questionnaire is reviewed every three years to ensure its relevance, considering the context of participants, and to enhance reliability and validity. The revision is important, assuming that some questions may not measure what they should. It also helps to incorporate current development, culture and conceptualization of a phenomena. However, most of the contents in the questionnaire remain unchanged to ensure that the data is suitable for comparative study (Frøyland, 2017).

This study particularly included adolescents in lower secondary school ( $N=119346$ ) from 309 municipalities (Appendix I) using Ungdata Survey, 2014-2016.

## **5.4 Measures**

Measures are social constructs; the process of constructing measures is a challenging task in a social science research. This is because social problems are socially constructed, i.e. they are not something just present in nature, like a hydrogen atom and the planet Jupiter. For example, violence in this context is not of a ‘natural kind’ but is a socially constructed concept. Characterization and representation are important to construct systemic measures in research. *Characterization* is a process of explicitly presenting categories in a concept. It requires delineation within a variable using value, and the delineation process should be consistent with the research purpose. There are no strict criteria of inclusion to categorise a value in a social problem. Rather, concepts must be operationalised before the delineation process (Cartwright & Runhardt, 2014).

*Representation* is a method to represent the quantity or category in a scientific research (Cartwright & Runhardt, 2014). According to Stevens cited in Cartwright & Runhardt (2014), there are four types of representing a concept: numeral, ordinal, interval and ratio scales. The variables that were used in the study have numeral and ordinal scales. The individual- and familial-level predictors were converted to numeral (binary) variables, which are labelled into two categories. It means that the numbers assigned to values cannot be interpreted as numbers; they are rather treated as labels. This has an advantage because they can be treated as proportions.

The measures found in Ungdata survey were formulated based on previously validated instruments in addition to adjusted new scales that fit in local conditions of municipalities (Nordfjærn, Dahl & Flemmen, 2013). Using 2014-2016 Ungdata survey questionnaires, two control variables (*year of survey and gender*), five individual-level predictors (*alcohol use, cigarette use, snus use, hash, marijuana and cannabis use, and depressive symptoms*), and two familial-level predictors (*parental control, and parents' financial status*) were included in the study.

#### *Control Variables: Year of survey and Gender*

Two background variables of year of survey and gender were used as control variables in the study. The purpose was to control the possible effect of survey year and gender on the association between the predictors and violent behavior. Year of survey has categorical values in the dataset; 1 – 2014, 2- 2015 and 3 - 2016. Gender is a dummy variable in the questionnaire. Question was asked: “Are you a boy or a girl?” and the response options was 0 – boy, and 1 – girl.

#### *Dependent Variable: Violent Behavior*

Violent behavior was indicated by a binary variable showing *presence or absence of rule-breaking, bullying, or digital bullying* in the previous 12 months. *Rule-Breaking* was measured with the question, “how many times have you taken part in or done any of acts stated in Table 5.1 over the past year?” The response options given for the measures were, 1- never, 2- once, 3- 2-5 times, 4- 6-10 times and 5-11 or more times. Those who report at least one instance of either of the included acts were coded with presence of rule- breaking.

**Table 5. 1 Rule-Breaking, Variable Components, by Question**

Number	Question
1	Shoplifting
2	Been in a fight with and without a weapon
3	Used threats to get money or objects from someone else
4	Vandalism
5	Broken into a building to steal
6	Stolen money from known persons
7	Illegally spray-painted or tagged walls, buildings, trains, and buses
8	Not paid for cinema, events, bus and train tickets
9	Spent the whole night away from home without parent's awareness
10	Downloaded and copied file illegally from internet
11	Had contact with the police because of something bad that you have done

*Bullying* was measured by a question, i.e., “do you sometimes take part in teasing, threatening or freezing out other young people at school or in your free time?” And the question for *digital bullying* was, “do you sometimes take part in teasing or threatening other young people on the internet or by mobile phone?” The response options for both were 1 –yes, several times in a week, 2 – yes, around once in a week, 3 – yes, around once a fortnight, 4 - yes, around once a month, 5 – almost never, and 6 – never. Those who report at least one instance of either of the included acts were coded with the presence of bullying and digital bullying.

Based on the odds of rule-breaking, bullying and digital bullying items, a dummy variable for violent behavior was created. It was defined as having participated one instance in the previous 12 months of either rule breaking, bullying, and digital bullying—either one of these acts were considered as the presence of “violent behavior”. vs. “no acts of violent behaviour”.

#### *Individual-level Variables*

The Individual-level variables were health-risk behaviors of cigarette, alcohol, snus, hash, marijuana and cannabis use, and depressive symptoms. Health-risk behaviors were measured based on the following questions: (a) *Alcohol use*: how many times have you done any of the following things over the past year? —had so much drink and felt intoxicated (b) *Hash, marijuana, and cannabis use*: how many times have you done any of the following things over the past year? — used hash, marijuana, cannabis. The response options given were 1 – never,

2 – once, 3 –2-5 times, 4 –6-10 times, and 5 – 11 or more times. (c) *Cigarette use*: Do you smoke? It has 5-point response scale 1 – I have never smoked, 2 – I used to smoke, but I have stopped completely now, 3 –I smoke less than once a week, 4 –I smoke every week but not every day, and 5 – I smoke every day (d) *Snus use*: Do you use snus (tobacco that you put under your lip)? It has 5-point response scale 1 – I have never used snus, 2 – I used to use, but I have stopped completely now, 3 –I use snus less than once a week, 4 –I use snus every week but not every day, and 5 – I use every day and (e) *Depressive symptoms*: During the last week, have you been affected by any of the following issues stated in Table 5.2.

**Table 5. 2 Depression Symptoms, Variable Components, by Question**

Number	Question
1	Felt that everything is a problem
2	Had sleep problems
3	Felt unhappy, sad or depressed
4	Felt hopelessness about the Future
5	Felt stiff or tense
6	Worried too much about things
7	Suddenly felt scared for no reason
8	Felt constant fear or anxiety
9	Felt exhausted or dizzy
10	Been nervous or felt uneasy
11	Been easily moved to tears
12	Tended to blame yourself for things

Depressive symptoms were measured using an instrument inspired by the Depressive mood Inventory (see Kandel & Davies, 1982). This measure was drawn from the Hopkins Symptom Checklist (Frøyland, 2017). It has 4-point scale response options 1 – not been affected at all, 2 – a little bit, 3 – quite a lot and 4 – extremely.

All individual-level predictors of health risk behaviors were changed to dummy variables. The cut off value for presence of health risk behaviors was at least one instance in the previous 12 months of their respective behavioral characteristics.

### *Familial-level Variables*

Familial-level predictors are parental control and parents' financial status. *Parental control* question was "here are some statements about how you might describe your relationship with your parents'. How true are they for you? My parents usually know where I am, and who I'm with, in my free time." The response options given were 1 – very true, 2 – quite true, 3 – not very true and 4 – not true at all. The four items were dichotomized into parental control vs. less parental control over the last 12 months. *Parents' financial status* variable has one question i.e., "financially, has your family been well-off, or badly off, over the past two years?" It has 5-point scale response options 1 – we have been well-off the whole time, 2 – we have generally been well-off, 3 – we have neither been well off nor badly off, 4 – we have generally been well-off, and 5 – we have been badly off the whole time. The five items were dichotomized into financially well off vs. not financially well-off the last 12 months.

### *Municipal-level Variables*

Based on Municipality State Reporting (KOSTRA) database in Norway, three municipal-level variables were included: *centrality*, *proportion of immigrants and Norwegian-born to immigrant parents* and *proportion of higher education accomplishment*. Centrality refers to municipality based geographical location as related to urban settlement, population size, and public service. It has four centrality levels: 1–least central, 2–less central, 3– quite central and 4– central. The proportion of immigrants and Norwegian-born to immigrant parents, and proportion of higher education accomplishment are continuous variables. For the purpose of this study, they were converted to categorical variables using median split of 33.33<sup>rd</sup>, 66.66<sup>th</sup> and 100<sup>th</sup> percentile. Following the median split, the municipalities falls under 33.33<sup>rd</sup> percentile coded into *low*, *medium* between 33.33<sup>rd</sup> - 66.66<sup>th</sup> percentile and *high* for 66.66<sup>th</sup> percentile and above.

## **5.5 Data Analysis**

The study used univariate, bivariate, and multilevel analysis. All data analyses were performed using the IBM Statistical Package for Social Sciences (SPSS), except for the multilevel logistic regression, for which the Statistics and Data (Stata) software was used. Stata was found to be more convenient than SPSS in analyzing multilevel logistic regression. All



data was initially entered, and syntax was written in SPSS and imported to Stata to run a multilevel modelling. The remaining descriptive and inferential statistical analysis were analyzed using SPSS.

### **5.5.1 Univariate Analysis**

Univariate analysis means analyzing one variable at a time, for example estimating descriptive statistics of frequency, measures of central tendency and dispersion (Bryman, 2012). The study has used univariate analysis to calculate frequency table of respondents' distribution based on control variables, individual-, familial- and municipal-level predictors and outcome variable of violent behavior.

### **5.5.2 Bivariate Analysis**

Bivariate analysis aims to examine the relationship between two variables and search for evidence that the variation in one variable coincides with variation in another variable. Contingency table, cross-tabulation, Pearson's  $r$  correlation, Spearman's rho, phi and Cramér's  $v$  are examples of bivariate analysis (Bryman, 2012). Cramér's  $v$  correlation was used to examine relationships between ordinal-nominal, nominal-nominal and dichotomous-nominal variables. Spearman's rho was used to identify associations between ordinal-dichotomous and ordinal-ordinal variables, and for between-dichotomous associations phi was used (Table 5.3). The relationship between the outcome variable (violent behavior), control variables (year of survey and gender) and the socio-ecological predictors were tested. This helps to investigate variable associates that are not qualified to be used in multilevel regression model. In correlational analysis,  $r$  value with  $p < 0.05$  close to  $-1$  and  $+1$  shows a strong association. Risjord (2014) notes that a weak association indicates there is lower probability as  $x$  increases or decreases would increase or decrease the second variable of  $y$ . Another reason to use correlational analysis was to examine the relationship between the independent variables. This helps to examine high degree of correlation between the predictors, i.e. multicollinearity. As stated in different literatures, such as Singh (2007), multicollinearity causes a problem to conduct regression modelling because it affects model fit to interpret results.

**Table 5.3 Type of Variables**

Variable	Type
Year of survey	Nominal
Gender	Dichotomous
Violent behavior	Dichotomous
Alcohol use	Dichotomous
Cigarette use	Dichotomous
Snus use	Dichotomous
Hash, marjawnna and cannabis use	Dichotomous
Depressive symptom	Dichotomous
Parental control	Dichotomous
Parents' financial status	Dichotomous
Centrality	Nominal
Proportion of immigrants and Norwegian-born to immigrant parents	Ordinal
Proportion of higher education accomplishment	Ordinal

Cross-tabulation was used to examine the distribution of individual-, familial- and municipal-level characteristics as related to presence and absence of violent behaviour. This type of bivariate analysis helps to investigate “frequencies of observations that belong to specific categories on more than one variable. It generally allows to identify relationships between the cross-tabulated variables based on the cell values” (Singh, 2007, p. 126).

### **5.5.3 Multivariate analysis: Multilevel Logistic Regression**

Multivariate analysis examines the association between more than two variables. This type of analysis lowers the risk of an association being spurious (Bryman, 2012). The philosophical assumption here is that bivariate analysis *per se* does not show a complete picture of association. As related to this study, for example, violent behavior would not merely occur from regular consumption of alcohol; other factors may also predict, such as depression and substance use. The study has used interventionist view of causation, notably regression modelling to examine associated factors for violent behavior and its variation between municipalities among Norwegian adolescents.

Multilevel logistic regression, notably a two-level analysis was deemed appropriate considering the nested nature of Ungdata and the study purpose to examine individual and municipal level difference in prevalence of violent behaviour. The study estimated six models using multilevel logistic regression. It began with model 1 to estimate variance components with no predictors which is called null model. Model 1 included violent behavior in a random intercept to examine its variation between municipalities. The null model estimates between-municipalities variance based on Intraclass correlation coefficient (ICC) result. The null model estimates variance based on the ICC result.

The ICC result is estimated based on

$$\rho = \sigma_{Between}^2 / (\sigma_{Between}^2 + 3.29_{Within}) \quad (\text{Heck, Thomas \& Tabata, 2012}).$$

In this study, the ICC result indicates about 1.58% ( $0.053 [0.053 / (0.053 + 3.29)]$ ) of the variability in presence of violence lies between municipalities (see Table 6.5). Traditionally, ICC lower than 5% would mean that the use of multilevel modelling is not recommended (Heck, Thomas & Tabata, 2012). However, contemporary researches, such as Huang (2018) pointed out that low ICC (even as low as .01) result in null model may indicate the use of multilevel modelling. This is because a significance variation would be observed in design effect between a null model and a model after adding predictors, especially in data with a large population. It is also important to comprehend that ICC is not the sole determinant of the design effect (Huang, 2018). Hence, -2 log likelihood estimation was needed in this study to examine better fit model in order to evaluate if a new model is better than previous one based on LR-test:

$$X^2 = [-2LL(\text{baseline})] - [-2LL(\text{new})],$$

with degrees of freedom =  $k_{\text{baseline}} - k_{\text{new}}$ , where  $k$  is the number of parameters in each model (National Center for Research Methods [NCRM], 2011). Significant reductions in -2 log likelihood (-2LL) was required to assume better fit in multilevel model estimation and stepwise method was used to compare models.

The study adjusted the random intercept by adding year of survey in model 2 and gender in model 3. Model 4 included individual-level factors to estimate variation in violent behavior because of individual-level characteristics. Model 5 included familial-level predictors to examine its explanatory power on variability in municipality intercept. Finally, municipal-level predictors added in model 6 to estimate variation in violent behavior because of municipal-level characteristics.

Another use of multilevel logistic regression model in this study was to examine associations between violent behaviour and the explanatory factors by estimating odds ratios and confidence intervals. Using Stata software, the confidence interval below 95% ( $P < 0.05$ ) was a base to reject association and above 95% was accepted. This helped to identify the association of each independent variable (x) with the dependent variable (y).

### *Assumptions*

Multilevel logistic analysis is an advanced form of logistic regression; hence logistic regression assumptions must be met before it can be used. In contrast to linear regression, using logistic regression does not require basic assumptions of linearity and additivity, normality, and homoscedasticity. But other assumptions, such as observation independence and absence of multicollinearity should be accounted for (Schreiber-Gregory, Jackson, & Bader, 2018; Statistics Solutions, n.d).

The study has particularly used a binary logistic regression to build a mixed model. One assumption for using this requires the outcome variable to have a dummy value (Statistics Solutions, n.d). As presented above, the outcome variable violent behavior was created as a dummy form. The outcome variable values should also be coded as '0' and '1', of which '1' shows the desired outcome. In this study, the presence of violent behavior was coded as '1' to indicate the desired outcome. Another assumption of logistic regression requires little or no multicollinearity, which means that the independent variables shall be independent for each other, i.e. they must not be highly correlated. The study satisfied this assumption as stated in section 6.3, most of between independent variables correlation was ranging from weak to moderate. In addition, the sample size in logistic regression has to be large, which typically requires "minimum of 10 cases with the least frequent outcome for each independent variable

in a model” (Schreiber-Gregory, Jackson, & Bader, 2018, p.4). The study met this assumption because it has a quite large sample size,  $N=119346$ .

## **5.6 Data Quality: Reliability and Validity**

According to Bryman (2004), reliability and validity are the two major criteria to evaluate the quality of social research. According to Ungdata (2018), Ungdata ensured all reliability and validity concerns. The NOVA has stated that it is a high-quality dataset which satisfies strict methodological standards (Frøyland, 2015). Ungdata questionnaire was the same for all respondents in all schools and based on consistent methods and the same questions.

### *Reliability*

The reliability of the Ungdata if the variables are measured consistently using standardized scales was examined. This is called *internal reliability*, which means that the degree to which the indicators that make up a scale are consistent (Bryman, 2004). It was tested by the Cronbach’s alpha. The Cronbach’s alpha ( $\alpha$ ) coefficient value is generally acceptable when it is at least 0.7 or higher. Bryman (2012) suggests that a result of 0.80 and above implies an acceptable level of internal reliability. This means that the higher the value of alpha, the higher the internal consistency of the measure (Lyngstad-Alderfer, 2016). Scale reliability test was calculated for each variable separately, i.e., for variables consisting of more than one variable component. In this study, alpha value was estimated for rule-breaking and depressive symptoms. The rule-breaking variable consisted of 11 items ( $\alpha= .71$ ) and the depressive symptom variable consisted of 12 items ( $\alpha= .92$ ) (Appendix II).

### *Validity*

Validity means “the issue of whether an indicator (or set of indicators) that is devised to gauge a concept really measures that concept” (Bryman, 2012, p. 171). The Ungdata addressed the possible validity concerns in research, such as content validity, construct validity, and nomological validity as follows:

Content validity is the extent to which a measuring instrument provides adequate coverage of the topic under study (Kothari, 2004). It is often estimated from a review of the

literature on the concept and construct topic (Singh, 2007). Attention was paid to the relationship between the measures and the operationalized concepts. For example, violent behavior items, such as bullying, and rule-breaking were consistent to the operationalized concept discussed in Chapter four. Assessing content validity is limited because it is a subjective process for a researcher and there is no standardized test for measurement (Ringdal, 2013).

Another type of validity is construct validity, which mainly aims to examine whether a study actually measures a desired concept. In this study, violent behavior was operationalized as related to conceptual definitions. Construct validity suggests drawing the hypothesis from a theory that is relevant to the concept (Singh, 2007). The study hypotheses were deduced from concepts on associated risk factors of adolescent violence framed by the socio-ecological framework.

Nomological validity assumes that human behavior is complex, and no single factor can explain its causal association. Such complexity suggests the need for multifactorial and complex explanations. This study assumes that single or two-way variable association may not provide a complete picture to explain variation in violent behavior between municipalities and its associated factors. Nomological validity concisely refers to the extent that a measure relates to other measures in a theoretical network. It suggests the importance of correlations between factors or predictors (e.g. bivariate correlational analysis to show associates between predictors) and hypothesized causal relationship (e.g. multiple regression) (Engellant, Holland & Piper, 2016). This study consists bivariate correlational and multivariate multilevel regression analyses to ensure nomological validity.

## **5.7 Ethical Considerations**

Ethical issues should be respected in any social research because they relate directly to the integrity of the research (Bryman, 2004). As noted in the Norwegian Social Science Data Services (NSD) (2005), all Ungdata surveys that have been conducted since 2010 ensured high ethical standards. This study was conducted in accordance with the following ethical considerations: anonymity, informed consent and confidentiality, protecting participants from physical or mental discomfort, research clearance, and providing credit to others' work.

The Ungdata survey used an anonymous questionnaire, hence no personal information was collected. Parents were informed about their childrens' participation through mail and given the opportunity to prevent their children from participating. The mail consists of information on the questionnaire and about their child's right to withdraw from the study (Andersen & Bakken, 2015). Bryman (2012) suggested that research participants "should be given as much information as might be needed to make an informed decision about whether or not they wish to participate in a study" (p. 138). The respondents were informed of their rights, for example, they were notified that they can withdraw from the research at any time without any restrictions and may skip any questions that they did not feel comfortable answering (Andersen & Bakken 2015). To address deception concern, they were also well informed about the authentic purpose of the research. Deception is caused when participants receive incomplete information about a research.

Scholars, such as Bryman (2012), have noted that a social research should not harm participants. This harm can be both physical or psychological (Bryman, 2012). The risks to mental and physical harm were minimal in this study because survey questionnaire was used to collect data, and physical and psychological harm is low in this type of questionnaire. The respondents were also provided with contact information of a survey coordinator if they felt uncomfortable while filling out the questionnaire. Regarding data access, the permission to access Ungdata was received following a contract signed between the researcher and main supervisor. Only the researcher had access to the data collected from the interviews and observations, which are securely saved and have not been distributed to others. Furthermore, the information gathered from secondary data, books and journal articles have been appropriately acknowledged using the APA style.

## **5.8 Summary**

This chapter has discussed the study research design and methodology. Using 2014-2016 Ungdata survey, individual-, familial- and municipal-level measures were developed that are consistent to the socio-ecological framework. The results of the study from frequency table, cross-tabulation, bivariate correlation and multilevel logistic regression are presented in the next chapter.

## **CHAPTER SIX**

### **RESULTS**

This chapter presents the results from analysis of data on municipal-level variations in prevalence of violent behavior among Norwegian adolescents and its association to individual-level factors of health-risk behaviors and familial predictors, and municipal-level factors. The data were obtained from Ungdata cross-national survey on adolescents of lower secondary school at the municipality level. The first section presents descriptive statistics results for background of the study population, followed by analysis of individual-, familial- and municipal-level factors as related to presence and absence of violent behavior. Using a bivariate correlation, section 6.3 analyzes the relationships between the control, individual- familial- and municipal-level predictors. Finally, section 6.4 presents multilevel logistic regression results of individual-, familial and municipal-level variations of violent behavior between municipalities.

#### **6.1 Background of the Study Population**

The first part presents respondents' distribution based on survey year, gender and centrality of municipalities. It identifies descriptive statistics of prevalence of violent behavior, health risk behaviors of depressive symptoms, alcohol, cigarette, snus, hash, marijuana and cannabis use among adolescents between municipalities over the last year. It also presents respondents' distribution based on familial predictors and municipal-level characteristics.

The study consisted of 50.3% boys and 49.7% girls of adolescent age, from lower secondary school. The results indicated that 65% of the participants were from central municipality, and 18.6%, 7.2%, and 9.3% were from quite-central, less-central, and least-central respectively. The prevalence of violent behavior over the last year was 50.5%. Among the types of violent behavior, the prevalence of rule-breaking, bullying, and digital bullying was 50.1%, 3.9%, and 2.4% respectively. The result also shows that the proportion of adolescents who showed violent behavior in 2014 survey was 53.7%, 51.8% for 2015, and 46.9% for 2016 (Table 6.1).



**Table 6. 1 Background of Ungdata Data and Participants, 2014-2016**

<i>N=119346</i>	N	%
Year of survey		
2014	30964	25.9
2015	43976	36.8
2016	44406	37.3
Gender		
Boys	58511	50.3
Girls	57786	49.7
Violent behavior		
Rule-breaking	60260	50.5
Bullying	58938	50.1
Digital Bullying	4599	3.9
	2778	2.4
Individual predictors (Health-risk behaviors)		
Alcohol use	9242	8.1
Cigarette use	8927	7.7
Snus use	5891	5.1
Hash, marjawn and cannabis use	7354	6.3
Depressive symptom	1851	1.6
Familial predictors		
Parental control	9242	8.1
Parents' financial status	113239	95.8
Municipal predictors		
Centrality		
Least	11093	9.3
Less	8537	7.2
Quite	22190	18.6
Central	77526	65
Proportion of immigrants and Norwegian-born to immigrant parents		
Low	40085	33.6
Medium	39143	32.7
High	40118	33.7
Proportion of higher education accomplishment		
Low	40198	33.7
Medium	38991	32.6
High	40157	33.7

N=Number, %= Percentage

The proportion of cigarette and snus use among adolescents was 5.1% and 6.3% respectively. The prevalence of depressive symptoms over the last year was 8.1%, and 7.7% for alcohol consumption and the prevalence of hash, marijuana and cannabis use was 1.6%. When it comes to familial predictors, 95.8% of the adolescents received parental control and 77.3% of the adolescents' parents were financially well-off in the last year. The result indicated that highest percentage of adolescents (33.7%) were from municipalities with high proportion of immigrants and Norwegian born immigrant parents. With regard to proportion of higher education accomplishment, 33.7% of adolescents were from municipalities with high proportion, 32.6% were from medium proportion, and 33.7% were from low proportion (Table 6.1)

## **6. 2 Individual-, Familial- and Municipal-Level Factors as related to Presence and Absence of Violent Behavior**

Table 6.2 presents descriptive statistics of individual-, familial- and municipal-level factors of Norwegian adolescents as related to presence and absence of violent behavior. Boys were found to be more violent than girls. The proportion of boys with presence of violence behavior was 59.5% and 41.3% for girls. The percentage of boys with absence of violent behavior was 40.5% and 58.7% for girls.

The result shows that adolescents showing violent behavior had higher depressive symptoms than those who did not engage. The proportion of adolescents showing violent behaviors and experiencing depressive symptoms was 9.9%, and the proportion of adolescents who did not show violent behavior but experienced depressive symptom was 6.3%. Adolescents showing violent behavior had higher use of alcohol consumption (13.1%) followed by snus (10.6%), cigarette (8.7%), and Hash, marijuana and cannabis (2.9%). The proportion of adolescents who did not show violent behavior but consumed alcohol was 2.2%, 1.5% for snus, 1.6% for cigarette and 0.3% for hash, marijuana and cannabis use. This shows that adolescents who showed violent behavior had a significantly higher tendency for alcohol consumption, snus use, cigarette use, and hash, marijuana and cannabis use than adolescents absent of violent behavior. Adolescents with the presence of violent behavior received less parental control than those who did not show. The proportion of adolescents with violent behavior and parental control was 93.2% and the proportion of adolescents without violent behavior and less parental control was 98.4% (Table 6.2).

**Table 6. 2 Individual-, Familial and Municipal Factors of Norwegian Adolescents with Presence and Absence of Violent Behavior**

%	Presence of Violent Behavior <i>N=60260</i>	Absence of Violent Behavior <i>N=59086</i>
Year of survey (% within year)		
2014	53.7***	46.3***
2015	51.8***	48.2***
2016	46.9***	53.1***
Gender (% within gender)		
Boys	59.5***	40.5***
Girls	41.3***	58.7***
Alcohol use (% within violent behavior)	13.1***	2.2***
Cigarette use (% within violent behavior)	8.7***	1.6***
Snus use (% within violent behavior)	10.6***	1.5***
Hash, marijuana and cannabis use (% within violent behavior)	2.9***	0.3***
Depressive symptom (% within violent behavior)	9.9***	6.3***
Parental control (% within violent behavior)	93.2***	98.4***
Parents' financial status (% within violent behavior)	74.1***	80.6***
Centrality of Municipalities (% within municipalities)		
Least central	48.2***	51.8***
Less central	47.3***	52.7***
Quite central	48.4***	51.6***
Central	51.8***	48.2***
Proportion of immigrants and Norwegian-born to immigrant parents		
Low	47.9***	52.1***
Medium	50***	50***
High	53.5***	46.5***
Proportion of higher education accomplishment		
Low	48***	52***
Medium	48.6***	51.4***
High	54.8***	45.2***

\*\*\*  $p < 0.001$ , N=Number, %= Percentage

With regard to parents' financial status, adolescents with presence of violent behavior parents had low financial status than those who did not show. As shown in Table 6.2, the proportion of adolescents showing violent behavior and from financially well-off parents was 74.1%. The proportion of adolescents who did not show violent behavior but from financially well-off parents was 80.6%.

The result indicates that the proportion of adolescents with violent behavior was highest in central municipalities. As indicated in Table 6.2, the prevalence of adolescents who showed violent behavior was 51.8% in central municipality, followed by quite central (48.4%), less central (47.3%) and least central (48.2%). The proportion of adolescents with absence of violent behavior was highest in less central municipality (48.2%) followed by least central (51.8%), quite central (51.6%) and central (48.2%). This shows a minor difference between adolescents' presence and absence of violent behavior across centrality categories.

Table 6.2 shows that the percentage of adolescents with violent behavior had higher percentage in municipalities with high proportion of immigrants and Norwegian born immigrant parents, than those who did not show violent behavior. The former was 53.5%, followed by 50% in municipalities with medium proportion of immigrants and Norwegian born immigrant parents, and 47.9% in municipalities with low proportion of immigrants and Norwegian born immigrant parents. The proportion of adolescents who did not show violent behavior was highest in municipalities with low proportion of immigrants and Norwegian born immigrant parents (52.1%), followed by in municipalities with medium proportion (50%), and high proportion of the same (46.5%).

Adolescents with presence of violent behavior had higher percentage in municipalities with high proportion of higher education accomplishment, than those who did not show violent behavior. The prevalence of adolescents who showed violent behavior was 54.8% in municipalities with high proportion of higher education accomplishment, followed by 48.6% in municipalities with medium proportion and 48% in municipalities with low proportion of the same. The proportion of adolescents who did not show violent behavior was highest in municipalities with low proportion of higher education accomplishment (52%), followed by in municipalities with medium proportion (51.4%) and in municipalities with high proportion of the same (45.2%) (Table 6.2).

According to the cross-tabulation results, the distribution of all individual-, familial- and municipal-level predictors showed variation ranging from small to high between the presence and absence of violent behavior. This indicates other statistical associations presented below, which should be used to uncover further associations that may explain the variation.

### 6.3 Correlation between Control, Individual-, Familial-, and Municipal- level Predictors

The study has conducted a correlational analysis for all variables. As presented in Table 6.3, the association between all individual predictors of health-risk behavior were moderate positive, except for depressive symptoms. The highest correlation was  $r = 0.59, p < .01$  between *cigarette* and *snus* use. The associations between *alcohol and cigarette use* was  $r = 0.44, p < .01$ , *alcohol and snus use*,  $r = 0.47, p < .01$ , *alcohol and hash, marijuana, and cannabis use*,  $r = 0.35, p < .01$ , and *cigarette and hash, marijuana, and cannabis use*,  $r = 0.37, p < .01$ . There was a low positive correlation between depressive symptoms and other health-risk behaviors.

There was a very low correlation between the control variable, *year of survey* and *violent behavior*,  $r = 0.05, p < .01$ . There is no indication for the direction of the relationship because Cramér's correlation was used to test the correlation between the two variables. The other control variable, *gender* was negatively related to *violent behavior*,  $r = -0.18, p < .01$  and this shows that boys were more violent than girls. In terms of gender and independent variable correlations, *gender* was positively associated to depressive symptoms,  $r = 0.12, p < .01$ . It means that respondents who showed violent behavior were more likely to experience depressive symptom. There was also a very weak positive correlation between *gender* and *alcohol use*,  $r = 0.08, p < .01$ , and *gender* and *parental control*,  $r = 0.04, p < .01$ . A very weak negative correlation was found between *gender and hash, marijuana, and cannabis use*,  $r = -0.04, p < .01$ , *gender and cigarette use*,  $r = -0.17, p < .01$ , *gender and snus use*,  $r = -0.03, p < .01$  and *gender and parents' financial status*,  $r = -0.18, p < .01$  (Table 6.3).

With regard to dependent-independent variable correlations, the highest was between *violent behavior and alcohol use* with  $r = 0.2, p < .01$ , followed by *violent behavior and snus use* with  $r = 0.19, p < .01$ , *violent behavior and cigarette use*,  $r = 0.18$ , and *violent behavior and hash, marijuana, and cannabis use*,  $r = 0.1, p < .01$  (Table 6.3).

**Table 6. 3 Correlation between Control, Individual-, Familial-, and Municipal- level Predictors**

No.	Correlation	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Year of survey <sup>a</sup>	1												
2	Gender <sup>b</sup>	.001	1											
3	Violent behavior <sup>c</sup>	.05**	-.18**	1										
4	Alcohol use <sup>c</sup>	-.05**	.08**	.2**	1									
5	Hash, marijuana cannabis use <sup>c</sup>	.01**	-.04**	.1**	.35**	1								
6	Depressive symptoms <sup>c</sup>	.002	.12**	.06**	.075**	.06**	1							
7	Cigarette use <sup>c</sup>	.03**	-.017**	.18**	.44**	.37**	.08**	1						
8	Snus use <sup>c</sup>	.05**	-.03**	.19**	.47**	.32**	.06**	.59**	1					
9	Parents' financial status <sup>c</sup>	.009**	-.18**	-.08**	-.06**	-.05**	-.07**	-.07**	-.06**	1				
10	Parental control <sup>c</sup>	.015**	.04**	-.13**	-.17**	-.17**	-.07**	-.19**	-.17**	.09**	1			
11	Centrality <sup>d</sup>	.001	.001	.03**	.01**	.02**	.06**	.004	.01**	.03**	.02**	1		
12	Proportion of immigrants and Norwegian-born to immigrant parents <sup>e</sup>	.02**	.008*	.06**	-.01**	.02**	.22**	.005	-.02**	.06**	.006*	.45**	1	
13	Proportion of higher education accomplishment <sup>e</sup>	.2**	.009**	.08**	.01**	.03**	.19**	.02**	-.002	.06**	-.008**	.46**	.8**	1

\*\* p < 0.01, \* p < 0.05

a. 0 (2014) to 1 (2016)

b. 0 (girl), 1 (boy)

c. 0 (absence), 1 (presence)

d. 0 (least central) to 1 (central)

e. 0 (low) to 1 (high)

Furthermore, there was a low positive relationship between violent behaviors and depressive symptoms,  $r = 0.06$ ,  $p < .01$ . Hence, the results indicate that adolescents showing depressive symptoms and consuming alcohol, cigarette, snus, hash, marijuana, and cannabis were more likely to show violent behavior than those who did not show and consume. This supports the hypothesis which postulates the prevalence of violent behavior would be associated with individual-level factors of health-risk behaviors (Table 6.3).

Table 6.3 results showed that there was a low negative correlation between *violent behavior and parental control*,  $r=-0.13$ ,  $p < .01$  and *violent behavior and parents' financial status*  $r = -0.08$ ,  $p < .01$ . This shows that adolescents under less parental control and from financially not well-off parents were more likely to show violent behavior than those without. This supports the hypothesis which postulates the prevalence of violent behavior would be associated with familial-level predictors. With respect to municipal-level characteristics, there was a low statistically significant positive correlation between *violent behavior and centrality*, *proportion of immigrants and Norwegian-born to immigrant parents* and *proportion of higher education accomplishment*,  $r=0.03$ ,  $p < .01$ ,  $r=0.06$ ,  $p < .01$ , and  $r=0.08$ ,  $p < .01$ , respectively.

From the correlation results, it can be understood that the low correlation results between the variables may be non-significant after adjusted for confounding in the regression analysis presented in the next section.

#### **6.4 Individual-, Familial- and Municipal-level Variations of Violent Behavior between Municipalities**

The study used two-level multilevel logistic regression model to examine between-municipality variance for adolescents' violent behavior prevalence estimates obtained from the Ungdata. The data has hierarchical structure with  $n = 119346$  at level-1 (between-individual), nested within 309 municipalities at level 2 (between-municipality).

This section presents the results from the multilevel model to test hypotheses of the study. The variables were distributed into six models, where model 1 includes no predictors and model 2 and 3 include year of survey and gender as control variables. Model 4 adds individual-level factors to examine if municipal-level variation of violent behavior would be explained by individual factors. Model 5 included familial-factor predictors to examine if municipal-level variation of violent behavior would be explained by familial factors. Finally, model 6 added

municipal-level factors to examine if municipal-level difference of violent behavior would be explained by municipal characteristics.

#### **6.4.1 Multilevel Logistic Regression Model with no Predictors**

Table 6.5 summarizes the variance components of multilevel model with no predictors—null model—based on the results of multilevel logistic regression. The null model ICC result indicates that about 1.58% of the variability in presence of violence lies between municipalities. This shows a small variation in adolescents' violent behavior prevalence estimates between municipalities. The ICC result shows a significant part of the total variance is at individual level, i.e. not between-municipalities. But as noted in Huang (2016), the “best practice today is not to simply ignore the clustering effect, but to account for the clustering effect using multilevel model” (p. 493). This is because the design effect may have a large impact on the results (Huang, 2016). To examine its effect, the better fit of model was tested between binary and multilevel logistic regression based on -2 log likelihood estimation using LR-test. The result found that multilevel logistic regression model was a better fit than binary logistic regression. For example, a significant reduction of LR test noticed in each model from the binary to multilevel logistic regression,  $\chi^2(1) = 1405, p < .001$  in model 1,  $\chi^2(1) = 861, p < .001$  in model 4,  $\chi^2(1) = 909, p < .001$  in model 5, and  $\chi^2(1) = 578, p < .001$  in model 6, (Table 6.4).

#### **6.4.2 Multilevel Logistic Regression Model Adjusted to Year of survey and Age**

Table 6.5 includes model 2 and 3 results. Model 2 result shows a slight decrease of municipal-level variation for presence of violent behavior after the model adjusted to year of survey. The ICC result decreased from 1.58% to 1.44%. The better fit of model was tested based on -2 log likelihood estimation. A significant reduction of LR test was observed from model 1 to model 2 with  $\chi^2(1) = 59, p < .001$ . This indicates that model 2 is a better model to predict variation in violent behavior. The result also indicated that the odds of being violent were about 0.91 times lower for 2016 data to 2014. This means that the prevalence of violent behavior among adolescents was lower in the municipalities participating in the Ungdata survey in 2016 than in 2015 and 2014.



**Table 6. 4 Goodness of Fit Test Comparison between Binary and Multilevel Logistic Regression**

Parameter	Binary Logistic Regression				Multilevel Logistic Regression			
	Model 1 Intercept Only	Model 4	Model 5	Model 6	Model 1 Intercept Only	Model 4	Model 5	Model 6
-2*log likelihood	165436	140388	135819	135422	164031	139527	134910	134844
LR test vs. Logistic Model Difference					1405	861	909	578

LR test results of model 2 and 3 (adjusted to year and gender) and the odds ratio for logistic regression are not included in this table; the odds ratio for multilevel logistic regression are presented in Table 6.5

Model 3 result shows a slight increase of municipal-level variation for presence of violent behavior after the model adjusted to gender. The ICC result increased from 1.44% to 1.57%. The increase in ICC when including gender in the model may have happened when adding an individual level variable which is negatively correlated with the outcome variable (Gelman & Hill, 2006). Model 3 is a better model than model 2 to predict variation in violent behavior. A significant reduction of LR test from model 2 to model 3 with  $\chi^2(1) = 8154, p < .001$ . The odds ratio shows that being violent were about 0.47 times lower for girls than boys, which means boys were violent than girls.

### 6.4.3 Adding Individual-Level Factors in Multilevel Logistic Regression Model

Model 4 adds individual-level factors in the multilevel logistic regression model. These are health-risk behaviors of cigarette, snus, alcohol, hash, marijuana and cannabis use, and depressive symptoms. It tests hypothesis 2a which assumes municipal-level variation in the prevalence of violent behavior would be associated with individual-level factors (Table 6.5).

As presented in Table 6.5, the variance component for the intercept in model 4 indicated a slight difference observed on the variation across municipalities between model 3 and model 4. The ICC result in model 4 indicates about 1.64% of the variability in presence of violence lies across municipalities. This indicates that adding health-risk behaviors slightly increased difference on variation of violent behavior across municipalities. Model 4 is a better model compared to model 3 based on -2 log likelihood estimation of LR-test. A significant reduction of LR test from model 2 to model 3 with  $\chi^2(5) = 16291, p < .001$ .

As can be seen in Table 6.5, all individual-level factors were associated with the odds of the presence of violent behavior. The result noted that the odds of being violent were about 4 times higher for alcohol users than for non-users, when the other predictors effect is constant. This means that alcohol users adolescents were more violent than non-alcohol users. The odds of being violent were about 1.73 times higher for hash, marijuana and cannabis than for non-users. The odds of being violent were about 2.87 times higher for cigarette users than for non-users, when holding all other variables constant. The odds of being violent were about 2.77 times higher for snus users than for non-users. This indicates that hash, marijuana, cannabis, snus and cigarette users of adolescents were more violent than non-users. When it comes to depressive symptoms, the odds of being violent were higher in adolescents who showed depressive symptoms than those who did not show. The odds of violent behavior were 1.54 times higher in adolescents who experienced depressive symptoms than those not experienced.

The odds ratio of year of survey and gender continued to be significant with  $p < .001$  after adding individual-level predictors in model 4 (Table 6.5).

#### **6.4.4 Adding Familial-Level Factors in Multilevel Logistic Regression Model**

Model 5 includes familial-level factors in the multilevel logistic regression model. It tests hypothesis 2b which assumes municipal-level variation in the prevalence of violent behavior would be associated with familial-level factors, i.e. parental control and parents' financial status. It also tested hypothesis 3a which postulates municipal-level variation in the prevalence of violent behavior would be explained by individual- and familial-level factors.

As presented in Table 6.5, the variance component for the intercept in model 5 shows almost no change on the variation across municipalities between model 4 and model 5. The ICC result in model 5 indicates about 1.65% of the variability in presence of violence lies between municipalities. Familial-level predictors increased the municipal-level variance only by 0.01% from model 4. In respect of goodness of fit test, model 5 is a better model than model 4 because the LR test shows a significant reduction of  $-2 \log$  likelihood in model 5 with  $\chi^2(2) = 4617$ ,  $p < .001$ .

**Table 6. 5 Multilevel logistic regression, Individual- and Municipal-level Factors Variance Estimate**

Parameter	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Year of survey		0.91 (0.88-0.94) ***	0.91 (0.88-0.94) ***	0.91 (0.88-0.94) ***	0.91 (0.88-0.94) ***	0.91 (0.88-0.94) ***
Gender			0.47 (0.44-0.49) ***	0.43 (0.38-0.47) ***	0.42 (0.39-0.47) ***	0.42 (0.38-0.47) ***
<b>Individual-level Factors (AOR, 95% CI)</b>						
Alcohol use				4 (3.73-4.4) ***	3.9 (3.11-4.4) ***	3.9 (3.59-4.23) ***
Hash, marijuana and cannabis use				1.73 (1.4-2.1) ***	1.57 (1.74-2.75) ***	1.57 (1.25-1.96) ***
Cigarette use				2.87 (2.6-3.15) ***	2.61 (2.46-3.06) ***	2.6 (2.37-2.88) ***
Snus use				2.77 (2.5-3.01) ***	2.68 (2.69-3.22) ***	2.69 (2.4-2.9) ***
Depression symptom				1.54 (0.86-2.7) ***	1.45 (0.85-2.5) ***	1.45 (0.85-2.5) ***
<b>Familial-level Factors (AOR, 95%)</b>						
Parental control					0.33 (0.27-0.37) ***	0.33 (0.27-0.37) ***
Parents' financial status					0.66 (0.63-0.68) ***	0.67 (0.63-0.68) ***
<b>Municipal-level Factors (AOR, 95% CI)</b>						
Centrality-Municipalities						
Least central						1.04 (0.95-1.13)
Less central						0.99 (0.91-1.08)
Quite central						1.03 (0.91-1.16)
Central						1
Proportion of immigrants and Norwegian-born to immigrant parents						
High						1
Medium						1.07 (0.99-1.15)
Low						1.09 (0.96-1.24)
Proportion of higher education accomplishment						
High						1.17 (1.04-1.33) **
Medium						1.05 (0.97-1.13)
Low						1
<b>Variance intercept, I.e. Municipal level</b>						
ICC% / Estimate	1.58 (0.05)	1.44 (0.04)	1.57 (0.05)	1.64 (0.05)	1.65 (0.05)	1.39 (0.04)
-2*log likelihood	164031	163972	155818	139527	134910	134844

\*\*\* p < 0.001, \*\* p < 0.001; AOR, Adjusted Odds Ratio, CI, Confidence Interval; least central is a reference group in this model; *least central* is also not significant with p < 0.05 when *central* used as reference group.

As shown in Table 6.5, familial-level factors were associated with the odds of presence of violent behavior. The odds of being violent was about 0.33 times lower for adolescents received parental control than for those not received, when holding all other variables constant. This means that adolescents who did not receive parental control were violent than those received parental control. When it comes to parents' financial status, the odds of being violent was 0.66 times lower among financially well-off parents compared to those from not well-off. It indicates that adolescents from financially well-off parents were less violent than those from not well-off parents (Table 6.5).

The odds ratio of control variables and health-risk behaviors continued to be significant with  $p < .001$  after adding familial-level predictors in model 4 (Table 6.5).

#### **6.4.5 Adding Municipal-Level Factors in Multilevel Logistic Regression Model**

Model 6 adds municipal-level factors in the regression model and tested hypothesis 2c which postulates municipal-level variation in the prevalence of violent behavior would be associated with municipal-level factors. It also tested hypothesis 3b which assumes municipal-level variation in the prevalence of violent behavior would be explained by municipal-level factors. Three municipal-level predictors, i.e. centrality, proportion of immigrants and Norwegian-born to immigrant parents and proportion of higher education accomplishment were included in model 6 to examine its explanatory power on variability in municipality intercept. The result shows that centrality of municipality and proportion of immigrants and Norwegian-born to immigrant parents were not significant predictors of the prevalence of violent behavior with  $p > 0.05$  (Table 6.5).

As presented in Table 6.5, high proportion of higher education accomplishment was associated with presence of violent behavior. The odds of being violent was 1.17 times higher among adolescents from municipalities with high proportion of higher education accomplishment than those from municipalities with low proportion. There is no association between municipalities with medium and low proportion of higher education accomplishment and the prevalence of violent behavior with  $p > 0.05$ . The odd ratio of the control variables and individual- and familial-level predictors continued to be significant with  $p < .001$  after adding municipal-level predictors in model 6. In terms of variability, the ICC result in model 6 indicates about 1.39% of the variability in presence of violence lies between municipalities. Municipal-level predictors slightly reduced the municipal-level variance from 1.65% in model

5, i.e. a decrease of 0.16%. Adding municipal-level variable in model 6 slightly improved the model fit because -2 log likelihood estimation of LR-test is statistically significant with  $\chi^2(4)=66, p < 0.05$  (Table 6.5).

In general, the result shows that the values of the -2-log likelihood result decreased after additional variables added in each model. This indicates that model 6 is a better model to predict the prevalence of violent behavior among adolescents than model 1-5. LR change was very high when individual predictors added, followed by familial but very low when municipal factors added.

## **CHAPTER SEVEN**

### **DISCUSSION**

This chapter discusses the results from analyses of data that were obtained from the Ungdata cross-national survey on adolescents of lower secondary school at the municipal level. It analyzes the results in light of the framework of analysis and other discussion of violent behaviour among adolescents. This analysis aims to understand variations in prevalence of violent behavior across municipalities and its association to individual-, familial- and municipal-level factors of adolescent violence perpetration.

The discussion summarizes the study findings in respect of the hypotheses and their interpretation in view of the socio-ecological framework. It then analyze social work intervention in the prevention of adolescent violence based on the socio-ecological model, followed by discussing implications and limitation of the study.

#### **7.1 Findings and Hypothesis**

##### **7.1.1 Prevalence of Violent behavior among Norwegian Adolescents**

The results in this study showed that a significant proportion of Norwegian adolescents showed at least one form of the measured violent behaviours over the last year. Rule-breaking had the highest prevalence, followed by bullying and digital bullying. The prevalence of rule-breaking was 50.1%, and to the best of the researcher's knowledge, no study has examined the estimates of rule-breaking in totality; although prevalence estimates of its manifestations, such as physical aggression and vandalism prevalence estimates have been examined in previous studies (see CDC, 2010; Haalad, 2000; WHO, 2015; WHO, 2002). The prevalence of bullying among adolescents was 3.9%, which is lower than the 40-country cross-national analysis by Craig et al. (2009), which includes Norway and Sweden. According to Craig et al. (2009) study, approximately 10.7 % of adolescents participating in the study ( $n = 53,249$ ) reported that they were bully perpetrators. Compared to a study in Norway by Olweus et al. (2014), the prevalence is almost similar. Their study showed that approximately 4% of the students in elementary and lower secondary schools were pure bullies (Olweus et al., 2014). When it comes to digital bullying, the result in this study indicated that 2.4 % of adolescents reported that they were digitally bullying others. The proportion is slightly lower than the 2012 Olweus' Pupil Survey

(3.8%) and the 2012 Media Authority's survey (5%) (Norwegian Ministry of Children, Equality and Social Inclusion [NMCES], 2017).

The prevalence violent behavior was shown a decrease in each survey year. Estimates were lower in the municipalities participating in the Ungdata surveys in 2016 than in 2015 and 2014. The prevalence of violent behavior was highest among adolescents live in central municipality compared to quiet, less and least central.

### **7.1.2 Variation of Violent behavior among Norwegian Adolescents between Municipalities**

The study findings showed that hypothesis 1 is *supported* despite the proportion of variance in violent behavior at the municipal level was low. As presented in Chapter six, the variance components of a multilevel null-model result show a low ICC, which is 1.58% of the variability in presence of violent behavior lies between municipalities. This suggests a small variation in the prevalence of violent behavior among adolescents between municipalities. Figure 7.1 presented the mean variance of the prevalence of violent behavior across municipalities. Despite some municipalities had low or high rates of violent behavior, about 50% of the municipalities mean score was ranging from 44%-53%. Most municipalities with prevalence rates far from the mean are quite small. This narrowed distribution supports the ICC estimate of a small municipal-level variability in the prevalence of violent behavior among adolescents.

### **7.1.3 Individual-level Factors for Violent Behavior**

The study result showed that hypothesis 2a is *supported* which postulates individual-level factors of health-risk behaviours would be associated to the prevalence of violent behaviour. All individual-level factors when adjusted to year of survey and gender were significantly associated with the presence of violent behaviour among adolescents, i.e. health-risk behaviors of alcohol use, cigarette use, snus use, and hash marijuana and cannabis use, and depressive symptoms.

In the multilevel logistic regression result, the influence of gender on the presence of violent behavior was observed. The results indicated that the odds of being violent were lower

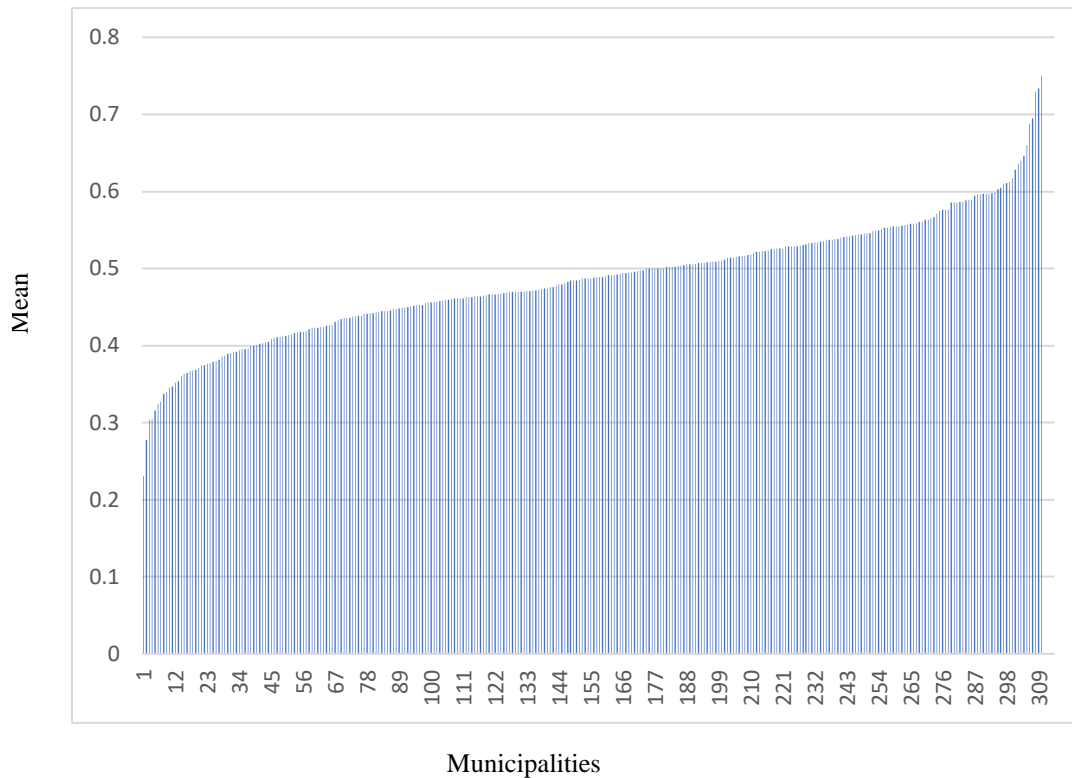


Figure 7. 1 Mean Variance of Violent Behavior across Municipalities

for girls than for boys, which means that boys were more violent than girls. The observed result is consistent to previous empirical evidences, such as Merrin et al. (2018), NMCES (2017) and WHO (2016). According to the WHO (2016), there was a greater likelihood of male adolescents showing violent behaviour than females, especially in physical fighting; however, some research does suggest that females are more likely to be violent in terms of verbal forms of aggression (Valois et al., 2002). This is because males are physically aggressive by nature and “it is likely that they would engage in aggressive interactions with their peers more frequently than females” (Merrin et al., 2018, p.51). WHO (2015) stated that male adolescents are at greater risk than females for becoming perpetrators and of victims of adolescent violence. The NMCES (2017) reported that in Norway, approximately one in four boys, as opposed to one in ten girls reported that they were showing violent behaviour in the past year. Merrin et al. (2018) study also show that violent behaviour, notably bully perpetration appears to be higher among males than females.

Previous research has documented the association between adolescent violence perpetration and health-risk behaviours. Alcohol consumption is one of the prevalent adolescent



health-risk behaviours (Krug et al., 2002; WHO, 2015). Consistent to the study hypothesis, the study found a significant association between alcohol use and violent behavior. This indicates that alcohol consumer adolescents were more violent than non-alcohol users, which is similar to previous study findings, such as Merrin et al. (2018), Silva et al. (2014) and Carlyle & Steinman (2007). According to Carlyle and Steinman's (2007) study, adolescents who frequently consumed alcohol were found to be bullying perpetrators compared to non-consumers. The WHO (2015) stated that alcohol use is both a risk factor for both violence perpetration and for victimisation, since it affects the psycho-cognitive functioning of adolescents, leading them to show violent behavior. Alcohol use would reduce self-control and the ability to process information and assess risks. Silva et al., (2014) study in Brazil showed that adolescents who consume alcohol were four times more likely to show violent behavior compared to non-consumers. However, it needs to be stressed that there is little empirical evidence which shows alcohol use causes violent behavior (Merrin et al., 2018).

As shown in the multilevel logistic regression analysis, cigarette use and violence perpetration were significantly associated, which is consistent with previous studies. Empirical findings from Silva et al., (2014) and Matuszka et al. (2017) have showed that cigarette use might increase the risk of violent behavior in children and adolescents. In Silva et al.'s, (2014) study, cigarette smoking was associated with violent behavior such that adolescent cigarette smokers were almost seven times more likely to indulge in violence perpetration than non-smokers. Although previous studies have rarely discussed why cigarette use predicts violent behavior, a study by Lewis et al. (2016) indicated that the association may have neurobiological explanation. For example, the components of tobacco, such as nicotine may disrupt neural circuit of smokers that increase aggressive responses.

The relationship between smokeless tobacco use and violent behavior is rarely researched. No empirical study has so far examined the association between snus use and violent behavior among Norwegian adolescents. As presented in the multilevel logistic regression analysis, snus use was associated with violent behaviour and the odds of being violent were higher in snus users than in non-users. This study adds to the existing literature by identifying snus use may be considered as an individual level factor which associates with violent behavior. Among adolescents in Norway, snus use is significantly increasing while the prevalence of smokers is decreasing (Grøtvedt et al., 2012). According to the NIPH (2014), the

significant increase in snus consumption is high both among male and female and “the increase could almost be described as an epidemic, and there are no signs of it stopping” (p. 17).

Consistent to previous study findings, a statistically significant association between hash, marijuana and cannabis use and violent behavior were found in the multilevel logistic regression analysis. Previous studies, such as Merrin et al. (2018), Silva et al. (2014) and Carlyle & Steinman (2007) suggest that substance use maybe one of the risk factors for violent behavior. Merrin et al. (2018) stated that adolescent marijuana consumers were involved in bullying perpetration at a higher rate than non-consumers. Similar to alcohol use, the effect of drug intoxication could cause attention deficits which may lead to violence perpetration, i.e. *psychopharmacological hypothesis* discussed in Chapter two (Wagner,1996). According to Silva et al. (2014), health-risk behaviors, such as marijuana use was associated with violent behavior. His findings indicated that adolescents who consumed marijuana were more likely to show violent behavior than non-users. Substance abuse and aggressive behavior study in Malaysia also shows that a statistically significant higher level of aggressive behavior among adolescents’ drug users than non-users (Fauziah et al., 2012).

The comorbidity of alcohol, tobacco and other substance use have been examined in previous studies. Comorbidity means the “co-occurrence of one or more disorders in the same adolescent at the same time” (Ollendick & King, 1994, p.919). In this study, the bivariate correlation result showed the comorbidity of alcohol, cigarette, snus, hash, marijuana and cannabis use. It indicated a positive moderate association between all aspects of substance use. This may mean that the co-occurrence of alcohol, cigarette, and other substance use among adolescents even though all aspects of substance use were significantly associated with violent behavior when controlling for each other.

Several studies have found the relationship between depressive symptoms and violence, but few studies have examined its correlates among adolescents (Xue, 2009). Consistent with the study hypothesis, the multilevel logistic regression result indicated that depressive symptoms were associated with violent behavior among Norwegian adolescents. The prevalence was higher for those who experienced depressive symptoms. This corresponds with the study of Terasaki et al. (2009) which showed the association between violent behavior and depressive symptoms. El-Slamoni & Hussien (2019) study found a statistically significant positive correlation between depressive symptoms and violent behavior of physical aggression.

Similarly, Mestre et al. (2017) empirical findings noted that depressive symptoms, notably anger predicts violent behavior among adolescents. Symptoms of depression may make adolescents to show violent behavior in combination with other risk factors for violence, such as substance use (WHO, 2015).

#### **7.1.4 A Microsystem Influence: Familial-level Factors for Violent Behavior**

In a microsystem influence, adolescents' interaction with their parents may influence their involvement in violent behaviours (Bronfenbrenner, 1994; Wernert, 2017). Previous studies, such as Ramirez (n.d) examined parent-adolescent relationship for violent behaviour. His result indicates "the more attachment adolescents have to their parents, the less likely they are to involve in violent acts" (p.14). The results in this study also found Hypothesis 2b which postulates familial-level factors of health-risk behaviors would be associated to the prevalence of violent behavior was supported. The familial-level predictors of parental control and parents' financial status when adjusted to survey year and gender were significantly associated with the prevalence of violent behaviour among adolescents.

Research has documented that the family environment and parenting style may foster the prevalence of violent behavior among adolescents (Baldry & Farrington, 2005; Flouri & Buchanan, 2003; Merrin et al., 2018; Wang et al., 2009). Odelola (2012) study noted that familial factors were significantly predicted violent behavior in-school adolescents. Consistent to the previous studies, the multilevel logistic regression analysis found a significant association between familial predictors of parental control and parents' financial status and violent behavior. Adolescents who received parental control and those from financially well-off parents were less violent than those without. This may have happened because the nature of connection between adolescents and their parents affects their involvement in risky behaviours (Ralph et al., 2009). And also, low economic status could negatively affect developmental outcomes in adolescents (Hosokawa & Katsura, 2018). The result corresponds with the WHO (2015) report which states that children who grow up in less parental supervision tend to be involved in violence perpetration as opposed to children who grow up in proper supervision. Yizhen et al. (2006) study noted that adolescent violent behavior of physical aggression was significantly associated with parents' socioeconomic status. One similar finding also revealed in Nielsen et al., (2018), indicating adolescents with low income families had the highest risk of violent offending than those from high income families.

### **7.1.5 An Exosystem Influence: Municipal-level Factors for Violent Behavior**

An exosystem does not have a direct influence on individuals, and its influence is not controllable at an individual level (Bronfenbrenner, 1994; Bronfenbrenner, 1979). For instance, adolescents living in urban areas are more likely to be involved in violence perpetration than those in rural areas (Krug et al., 2002; WHO, 2015). The study hypothesis 2c assumes that municipal-level factors would be associated with the prevalence of violent behavior among adolescents, i.e. centrality, proportion of immigrants and Norwegian-born to immigrant parents and proportion of higher education accomplishment. The result revealed that hypothesis 2c is *not* supported, except for high proportion of higher education accomplishment.

Centrality variable when adjusted to survey year and gender was not significantly associated with the presence of violent behaviour. As noted in Chapter 5, centrality predictor was classified based on urban settlement, and central municipalities were more urban than least central. The observed result in this study is consistent with most prior studies, except for few, such as Fagan et al. (2013) which uncovered adolescents in urban areas are at higher risk for involving in violent behaviors. It can be argued that the result difference might have come from variation in methodological and variables of interest and the context under which the study was conducted. For example, Fagan's et al. (2013) study did not include individual factors of health risk behaviors to predict violent behaviour. It was conducted in adolescents from low-income urban region excluding high-income areas, which may have impacted the result. In addition, there was a methodological difference between Fagan's et al. and this study, because they used hierarchical linear regression which did not examine between-neighborhood variation using multilevel model.

Several studies, such as Stansfield (2013), have examined the macro- and micro-level relationships between immigration and violence perpetration, of which most were found to be negative, few showed positive and others showed no association. The results in this study indicated no associations between immigration and violent behavior.

Research has increasingly documented a positive relationship between educational attainment and violence perpetration. For example, studies in the US and Sweden showed a causal effect of educational attainment in reducing violence perpetration (Hjalmarsson, 2012). In contrast to this, this study surprisingly found a higher prevalence of violent behavior among

adolescents from municipalities with a high proportion of higher education accomplishments, than those with lower proportions. This may have happened because municipalities with higher educational level were also larger and more central ones; additionally, central municipalities had the highest prevalence of violent behavior.

From the results discussed so far, all individual-factors and familial-level predictors (*microsystem influencers*) were significantly predicted the prevalence of violent behavior among adolescents. But the municipal-level factors (*exosystem influencers*) were not associated with violent behaviour, except for high proportion of higher education accomplishment. The following section will discuss the effect of adding these factors in multilevel logistic regression model to explain municipal-level variation.

#### **7.1.6 Are Individual-, Familial-level and Municipal-level Factors may explain Municipal-level Variation in Violent Behavior?**

The study revealed that hypothesis 3a is *not* supported which hypothesizes municipal-level variation in the prevalence of violent behavior would be explained by individual- and familial-level factors. After adjusted the random intercept by year of survey and gender, individual- and familial-level predictors did not explain the observed small variation in violent behavior among adolescents across municipalities.

The multilevel logistic regression model which includes individual- and familial level factors was a better model to predict violent behavior than the null- model and adjusted model for year of survey and gender. The model fit increased due to an increase in explained variance between-individuals, while the explained variance between-municipalities remained constant.

To a slight extent, the study results support hypothesis 3b which postulates municipal-level variation in the prevalence of violent behavior would be explained by municipal characteristics. The results showed the addition of municipal-level factors slightly reduced the municipal level variance, which indicates the factors, to a slight extent, explained the small variation in violent behavior among adolescents across municipalities. The model which included municipal-level factors provided the best fit to predict violent behavior among adolescents. In respect of effect size, however, LR change was very high when individual

predictors added, followed by familial factors but very low when municipal characteristics added in the model.

## **7.2 Social work Intervention in the Prevention of Adolescent Violence Perpetration based on Socio-Ecological Model**

This study aimed to contribute knowledge to the associated risk factors of violent behavior among adolescents that may help for prevention of violent behavior in view of the socio-ecological model. The concise discussions indicated below shows how the study findings may be relevant to social work intervention.

*Social workers' primary goal is to help people in need and to address social problems (...) draw on their knowledge, values, and skills to help people in need and to address social problems* (National Association of Social Workers [NASW], p. 2).

The socio-ecological framework is a comprehensive theoretical base in the prevention and management of violence. It is important for social workers to provide effective intervention not only working at individual level, “but also the systems that facilitate social functioning including the client's family, neighborhood, community and other critical social systems” (Pardeck, 1988, p.141). The framework has significantly been stressed in the field of social work and suggested social practitioners interventions, which focuses at micro, meso and macro level (Pardeck, 1988). Findings in this study demonstrated the ways in which multiple risk factors may be associated with increased violent behavior among adolescents. The socio-ecological thinking suggested intervention should target multiple risk factors that affect adolescents’ life, i.e. individual, family and community, but evidenced-based prioritization should be accounted for (Shaffer-McCuish, 2014).

The results of this study showed that the prevalence of violent behavior is still persisting among adolescents in Norway. Social workers have the skills to contribute in the efforts to reduce the prevalence of violence perpetration in Norway, considering the risk factors broader from the individual’s environment. For example, to reduce bullying perpetration, they are able to assist in implementing anti-bullying programs. At the micro level, social workers can assist bully perpetrators by providing counselling service (Shaffer-McCuish, 2014). At the macro level, as noted in Staples (2016), social practitioners may help to advocate for policies to reduce

violence perpetration based on socio-ecological understanding, notably by providing more emphasis on individual and familial factors considering the study findings.

As discussed in section 7.1.4, the study result shows that familial-level predictors were associated with the prevalence of violent behavior among adolescents. Consistent to prior findings, such as WHO (2015), social workers may help to strengthen parent-adolescent relationship to reduce the prevalence of violent behavior. For example, they may assist in designing parenting programs to increase parent-adolescent relationships aimed to reduce adolescents' behavioral problems, such as aggression. The WHO (2015) noted that “parenting programs significantly reduce child conduct problems in older children, whether assessed by parents or independently” (p. 28).

Another important area of intervention is enhancing adolescents life skills, which may help them manage their health-risk behaviors. Several risk factors for violent behavior may associate with lack of social and emotional skills (WHO, 2015). Social work profession emphasizes the importance of life skills in social work practice to enhance the psycho-social wellbeing of individuals and interpersonal skills (Aneesh & Tintu, 2014). Social practitioners may design and participate in life skills training programs (WHO, 2015). This can help the ability of Norwegian adolescents to deal interpersonal conflict, depressive symptoms and their ability to mitigate other risk factors, such as alcohol and substance use. Life skill training was also evident to address comorbidity or co-occurring disorders (Center for Mental Health Services, 2009).

### **7.3 Implications for Research and Policy Design**

The findings have several implications for research and policy design if risk factors for adolescent violent behavior understood based on the socio-ecological framework. The main contribution of the study is that using a large, nationally representative survey, it examined municipal-level variation in the prevalence of violent behavior. It also examined individual-familial- and municipal-level associates of violent behavior among Norwegian adolescents based on socio-ecological understanding — and how these factors may explain variation across municipalities.

One unique contribution of this study was the positive correlation between smokeless tobacco (snus) use and violent behavior, which has rarely been examined in previous studies. Great attention must be focused on this because, as discussed above, snus use among Norwegian adolescents is drastically increasing, both among male and female (Grøtvedt et al., 2012). Snus use should also be carefully controlled for in future studies on violent behavior associates.

Another implication for policy making in Norway can be found related to the findings, which showed a small variation in the prevalence of violence behavior across municipalities. The results indicated that about 98% variations were at individual level, implying more emphasis on between-adolescent variation than between-municipal, in order to reduce the prevalence of violent behavior.

The study also has relevance for research on violence in close relationships because it examines violent behaviours, such as physical fighting, bullying and digital bullying. Such behaviours are shown in relationships that might be considered close, for example family and friendship.

#### **7.4 Limitation of the Study**

This study seems to be the first to examine municipal-level variations in violent behavior among adolescents in Norway. It also provided a comprehensive finding of individual- and environmental-level associates of violent behavior seen in light of the socio-ecological model. The study used a cross-sectional design which limited to identify causal relationships. The study has not uncovered the relative predictive power of the socio-ecological associates of adolescent violent behavior. It has also not examined protective factors that may mitigate the risks relevant for designing effective intervention program. Likewise, the study did not examine cross-level interactions between individual factors, familial predictors and municipal characteristics. Due to the nature of Ungdata survey, the study was not able to include severe forms of violence perpetration, biological and other behavioral, psychological, relationship and community factors.



## CHAPTER EIGHT

### CONCLUSION AND SUGGESTION FOR FUTURE RESEARCH

This study has examined variation in the prevalence of violent behavior among Norwegian adolescents across municipalities and its socio-ecological correlates. This chapter presents the conclusion of the study and makes suggestions for future research mostly seen in light of the study limitations.

#### 8.1 Conclusion

The study argued that the socio-ecological correlates of violent behavior may provide a comprehensive understanding of risk factors associated with violent behavior. Results in this study indicated a small municipal-level difference in the prevalence estimates of violent behavior. This may mean that municipalities in Norway do not differ substantially in ecological characteristics account for violence perpetration. Drawn from the socioecological model, individual characteristics of health risk behaviors, microsystem familial predictors and exosystem municipal-level characteristics were hypothesized with a large sample of Norwegian adolescents. The factors of health-risk behaviors and microsystem familial predictors were associated with the prevalence of violent behavior. Almost all exosystem municipal-level characteristics were not associated with violent behavior. This may suggest the risk for showing violent behavior is mainly related to individual and microsystem factors among the Norwegian adolescents. The hypothesized ecological model, however, provided the best fit to explain variation in violent behavior.

The study purpose was to examine effects beyond the adolescent's individual-level characteristics of violent behavior, which can contribute to increasing knowledge among researchers, social work practitioners and policy makers to design and implement a holistic prevention program with enhanced protective factors. As indicated in the discussion chapter, individual factors associate widely understood in prior studies. Hence, the socio-ecological model findings from this study can help to examine the various individual level risk factors associated with violent behavior within the context of environmental input.

## 8.2 Suggestions for Further Research

Based on the study findings, further research should examine longitudinal effects of the socio-ecological correlates of violent behavior and its other associates that were not addressed in the study. Longitudinal study would examine trends in factors associated with violent behaviour which may show causal relationships. As part of addressing the other limitations in the study, it could be worthwhile to explore cross-level interactions across individual-, familial- and community-level factors discussed in Bronfenbrenner's (1979) ecological model. This would seek, for example, to unveil family influence in the context of different roles that adolescents play in a microsystem.

Given the nature of Ungdata, the study was limited to data gathered from adolescents' self-reports. Future research should include multiple source of data to provide a more comprehensive picture of the problem. Further research could also focus on the association between socio-ecological factors and more severe forms of violence perpetration that have not been addressed in this study, such as rape and homicide. This could contribute to explore further associate of adolescent violent behavior.

The predictors used in this study were limited to examine other socio-ecological associates of violence perpetration. Hence, further research should include biological and other behavioral, psychological, relationship and community factors. For example, it would be important to examine the effect of age and educational performance as individual factors; peer influence and single-parenting as relationship predictors; and social integration and neighborhood criminality as community characteristics. In addition to this, it could be worthwhile to examine between-school variation in violent behavior and its socio-ecological associates. Findings from previous studies, such as Merrin et al. (2018) have indicated that adolescents spend more time in school and its environment may influence their behaviour. In light of this, future studies could also include school-level factors that may increase risk of violent behavior among adolescents.

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## APPENDIX

### Appendix I. Distribution of Participants within Municipalities

		Frequency	Percent	Valid Percent	Cumulative
Valid	Halden	944	.8	.8	.8
	Moss	1541	1.3	1.3	2.1
	Fredrikstad	2422	2.0	2.0	4.1
	Hvaler	118	.1	.1	4.2
	Aremark	54	.0	.0	4.3
	Marker	119	.1	.1	4.4
	Rømskog	23	.0	.0	4.4
	Trøgstad	160	.1	.1	4.5
	Spydeberg	189	.2	.2	4.7
	Askim	485	.4	.4	5.1
	Eidsberg	389	.3	.3	5.4
	Skiptvet	152	.1	.1	5.5
	Råde	237	.2	.2	5.7
	Våler	179	.1	.1	5.9
	Hobøl	171	.1	.1	6.0
	Vestby	524	.4	.4	6.5
	Ski	966	.8	.8	7.3
	Ås	472	.4	.4	7.7
	Frogn	526	.4	.4	8.1
	Nesodden	673	.6	.6	8.7
	Oppegård	841	.7	.7	9.4
	Bærum	3956	3.3	3.3	12.7
	Asker	2053	1.7	1.7	14.4
	Aurskog-Høland	502	.4	.4	14.8
	Sørums	570	.5	.5	15.3
	Fet	357	.3	.3	15.6
	Rælingen	453	.4	.4	16.0
	Enebakk	349	.3	.3	16.3
	Lørenskog	1228	1.0	1.0	17.3
	Skedsmo	1743	1.5	1.5	18.8
	Nittedal	717	.6	.6	19.4
	Gjerdrum	217	.2	.2	19.5
	Nes	678	.6	.6	20.1
	Nannestad	394	.3	.3	20.4
	Oslo	12449	10.4	10.4	30.9
	Kongsvinger	546	.5	.5	31.3
	Hamar	844	.7	.7	32.0
	Ringsaker	1144	1.0	1.0	33.0
	Løten	215	.2	.2	33.2

Stange	602	.5	.5	33.7
Nord-Odal	179	.1	.1	33.8
Sør-Odal	270	.2	.2	34.1
Eidskog	221	.2	.2	34.2
Grue	153	.1	.1	34.4
Åsnes	232	.2	.2	34.6
Våler	100	.1	.1	34.7
Elverum	601	.5	.5	35.2
Trysil	176	.1	.1	35.3
Åmot	160	.1	.1	35.4
Stor-Elvdal	52	.0	.0	35.5
Rendalen	46	.0	.0	35.5
Engerdal	48	.0	.0	35.6
Tolga	55	.0	.0	35.6
Tynset	208	.2	.2	35.8
Alvdal	89	.1	.1	35.9
Følldal	56	.0	.0	35.9
Os	68	.1	.1	36.0
Lillehammer	802	.7	.7	36.6
Gjøvik	846	.7	.7	37.3
Lesja	78	.1	.1	37.4
Skjåk	74	.1	.1	37.5
Lom	80	.1	.1	37.5
Vågå	110	.1	.1	37.6
Nord-Fron	198	.2	.2	37.8
Sel	177	.1	.1	37.9
Sør-Fron	115	.1	.1	38.0
Ringebu	138	.1	.1	38.2
Øyer	157	.1	.1	38.3
Gausdal	195	.2	.2	38.4
Østre Toten	424	.4	.4	38.8
Vestre Toten	429	.4	.4	39.2
Lunner	290	.2	.2	39.4
Gran	431	.4	.4	39.8
Søndre Land	188	.2	.2	39.9
Nordre Land	188	.2	.2	40.1
Sør-Aurdal	86	.1	.1	40.2
Etnedal	43	.0	.0	40.2
Nord-Aurdal	187	.2	.2	40.3
Øystre Slidre	97	.1	.1	40.4
Vang	41	.0	.0	40.5
Drammen	1923	1.6	1.6	42.1
Kongsberg	769	.6	.6	42.7
Flå	35	.0	.0	42.7

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Nes	111	.1	.1	42.8
Gol	152	.1	.1	43.0
Hemsedal	81	.1	.1	43.0
Hol	138	.1	.1	43.2
Sigdal	122	.1	.1	43.3
Krødsherad	65	.1	.1	43.3
Lier	797	.7	.7	44.0
Røyken	473	.4	.4	44.4
Hurum	343	.3	.3	44.7
Nore og Uvdal	92	.1	.1	44.7
Tønsberg	1285	1.1	1.1	45.8
Porsgrunn	1103	.9	.9	46.7
Skien	1599	1.3	1.3	48.1
Notodden	418	.4	.4	48.4
Siljan	95	.1	.1	48.5
Bamble	513	.4	.4	48.9
Kragerø	322	.3	.3	49.2
Drangedal	155	.1	.1	49.3
Nome	228	.2	.2	49.5
Bø	347	.3	.3	49.8
Sauherad	140	.1	.1	49.9
Tinn	208	.2	.2	50.1
Hjartdal	52	.0	.0	50.2
Seljord	88	.1	.1	50.2
Kviteseid	91	.1	.1	50.3
Nissedal	41	.0	.0	50.3
Fyresdal	45	.0	.0	50.4
Tokke	88	.1	.1	50.4
Vinje	125	.1	.1	50.6
Risør	212	.2	.2	50.7
Grimstad	752	.6	.6	51.4
Arendal	1428	1.2	1.2	52.6
Gjerstad	181	.2	.2	52.7
Vegårshei	140	.1	.1	52.8
Tvedestrand	198	.2	.2	53.0
Froland	396	.3	.3	53.3
Lillesand	339	.3	.3	53.6
Birkenes	171	.1	.1	53.8
Åmli	126	.1	.1	53.9
Iveland	41	.0	.0	53.9
Evje og Hornes	220	.2	.2	54.1
Bygland	84	.1	.1	54.1
Valle	92	.1	.1	54.2
Bykle	65	.1	.1	54.3

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Kristiansand	5246	4.4	4.4	58.7
Mandal	525	.4	.4	59.1
Farsund	770	.6	.6	59.8
Flekkefjord	292	.2	.2	60.0
Vennesla	466	.4	.4	60.4
Songdalen	228	.2	.2	60.6
Søgne	355	.3	.3	60.9
Marnardal	59	.0	.0	60.9
Åseral	97	.1	.1	61.0
Audnedal	121	.1	.1	61.1
Lindesnes	171	.1	.1	61.3
Lyngdal	672	.6	.6	61.8
Kvinesdal	424	.4	.4	62.2
Sirdal	74	.1	.1	62.2
Eigersund	546	.5	.5	62.7
Sandnes	2323	1.9	1.9	64.6
Stavanger	3318	2.8	2.8	67.4
Haugesund	1216	1.0	1.0	68.4
Sokndal	101	.1	.1	68.5
Lund	117	.1	.1	68.6
Bjerkreim	114	.1	.1	68.7
Hå	651	.5	.5	69.3
Klepp	653	.5	.5	69.8
Time	623	.5	.5	70.3
Gjesdal	435	.4	.4	70.7
Sola	790	.7	.7	71.4
Randaberg	410	.3	.3	71.7
Forsand	56	.0	.0	71.8
Strand	485	.4	.4	72.2
Hjelmeland	218	.2	.2	72.3
Suldal	137	.1	.1	72.5
Sauda	146	.1	.1	72.6
Finnøy	123	.1	.1	72.7
Rennesøy	219	.2	.2	72.9
Bokn	30	.0	.0	72.9
Tysvær	416	.3	.3	73.2
Karmøy	1499	1.3	1.3	74.5
Vindafjord	353	.3	.3	74.8
Etne	164	.1	.1	74.9
Sveio	216	.2	.2	75.1
Bømlo	480	.4	.4	75.5
Stord	636	.5	.5	76.0
Fitjar	118	.1	.1	76.1
Kvinnherad	495	.4	.4	76.6

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Jondal	38	.0	.0	76.6
Ullensvang	110	.1	.1	76.7
Eidfjord	27	.0	.0	76.7
Ulvik	41	.0	.0	76.7
Granvin	30	.0	.0	76.8
Voss	488	.4	.4	77.2
Kvam	221	.2	.2	77.4
Fusa	117	.1	.1	77.5
Samnanger	68	.1	.1	77.5
Os	635	.5	.5	78.0
Austevoll	173	.1	.1	78.2
Sund	205	.2	.2	78.4
Fjell	454	.4	.4	78.7
Vaksdal	124	.1	.1	78.8
Lindås	420	.4	.4	79.2
Flora	297	.2	.2	79.4
Hyllestad	53	.0	.0	79.5
Årdal	163	.1	.1	79.6
Askvoll	99	.1	.1	79.7
Fjaler	80	.1	.1	79.8
Vågsøy	133	.1	.1	79.9
Molde	287	.2	.2	80.1
Kristiansund	801	.7	.7	80.8
Vanylven	111	.1	.1	80.9
Sande	86	.1	.1	81.0
Herøy	322	.3	.3	81.2
Ulstein	312	.3	.3	81.5
Hareid	145	.1	.1	81.6
Ørsta	368	.3	.3	81.9
Ørskog	90	.1	.1	82.0
Norrdal	68	.1	.1	82.1
Stranda	155	.1	.1	82.2
Sykkylven	294	.2	.2	82.4
Skodje	172	.1	.1	82.6
Sula	293	.2	.2	82.8
Haram	315	.3	.3	83.1
Midsund	150	.1	.1	83.2
Sandøy	82	.1	.1	83.3
Aukra	189	.2	.2	83.4
Fræna	283	.2	.2	83.7
Eide	126	.1	.1	83.8
Averøy	196	.2	.2	83.9
Sunndal	231	.2	.2	84.1
Rindal	77	.1	.1	84.2

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Halsa	45	.0	.0	84.2
Smøla	60	.1	.1	84.3
Aure	141	.1	.1	84.4
Hitra	142	.1	.1	84.5
Frøya	140	.1	.1	84.6
Ørland	163	.1	.1	84.8
Agdenes	38	.0	.0	84.8
Bjugn	145	.1	.1	84.9
Roan	36	.0	.0	85.0
Oppdal	246	.2	.2	85.2
Rennebu	84	.1	.1	85.2
Meldal	132	.1	.1	85.4
Orkdal	404	.3	.3	85.7
Røros	174	.1	.1	85.8
Midtre Gauldal	211	.2	.2	86.0
Melhus	591	.5	.5	86.5
Skaun	255	.2	.2	86.7
Malvik	483	.4	.4	87.1
Selbu	154	.1	.1	87.3
Tydal	25	.0	.0	87.3
Steinkjer	497	.4	.4	87.7
Meråker	77	.1	.1	87.8
Stjørdal	820	.7	.7	88.4
Frosta	223	.2	.2	88.6
Leksvik	134	.1	.1	88.7
Levanger	677	.6	.6	89.3
Verdal	535	.4	.4	89.8
Verran	85	.1	.1	89.8
Namdalseid	65	.1	.1	89.9
Snåsa	80	.1	.1	90.0
Lierne	66	.1	.1	90.0
Røyrvik	13	.0	.0	90.0
Namsskogan	37	.0	.0	90.1
Høylandet	54	.0	.0	90.1
Overhalla	115	.1	.1	90.2
Fosnes	24	.0	.0	90.2
Vikna	152	.1	.1	90.3
Nærøy	181	.2	.2	90.5
Leka	15	.0	.0	90.5
Inderøy	256	.2	.2	90.7
Bodø	1302	1.1	1.1	91.8
Sømna	85	.1	.1	91.9
Brønnøy	263	.2	.2	92.1
Herøy	92	.1	.1	92.2



Alstahaug	262	.2	.2	92.4
Leirfjord	66	.1	.1	92.5
Vefsn	413	.3	.3	92.8
Grane	57	.0	.0	92.8
Hattfjelldal	35	.0	.0	92.9
Dønna	48	.0	.0	92.9
Nesna	54	.0	.0	93.0
Hemnes	159	.1	.1	93.1
Rødøy	61	.1	.1	93.1
Meløy	226	.2	.2	93.3
Gildeskål	51	.0	.0	93.4
Beiarn	33	.0	.0	93.4
Fauske	299	.3	.3	93.7
Sørfold	74	.1	.1	93.7
Steigen	70	.1	.1	93.8
Hamarøy	50	.0	.0	93.8
Tjeldsund	40	.0	.0	93.9
Evenes	46	.0	.0	93.9
Ballangen	82	.1	.1	94.0
Flakstad	43	.0	.0	94.0
Vestvågøy	345	.3	.3	94.3
Vågan	283	.2	.2	94.5
Bø	95	.1	.1	94.6
Øksnes	263	.2	.2	94.8
Moskenes	28	.0	.0	94.8
Tromsø	1845	1.5	1.5	96.4
Harstad	705	.6	.6	97.0
Kvæfjord	102	.1	.1	97.1
Skånland	88	.1	.1	97.1
Ibestad	49	.0	.0	97.2
Gratangen	42	.0	.0	97.2
Bardu	131	.1	.1	97.3
Målselv	430	.4	.4	97.7
Sørreisa	141	.1	.1	97.8
Dyrøy	39	.0	.0	97.8
Lenvik	427	.4	.4	98.2
Balsfjord	144	.1	.1	98.3
Lyngen	107	.1	.1	98.4
Storfjord	64	.1	.1	98.5
Vardø	59	.0	.0	98.5
Hammerfest	301	.3	.3	98.8
Guovdageaidnu Kautokeino	77	.1	.1	98.8
Alta	623	.5	.5	99.3
Nordkapp	97	.1	.1	99.4

Porsanger Porsángu Porsanki	118	.1	.1	99.5
Kárásjohka Karasjok	82	.1	.1	99.6
Berlevåg	32	.0	.0	99.6
Deatnu Tana	82	.1	.1	99.7
Båtsfjord	73	.1	.1	99.8
Sør-Varanger	292	.2	.2	100.0
Total	119346	100.0	100.0	

## Appendix II. Reliability Test

### Reliability Test Rule-Breaking

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.71	.744	11

### Inter-Item Correlation Matrix

	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11
Item 1	1.000	.344	.260	.254	.202	.102	.161	.099	.224	.275	.107
Item 2	.344	1.000	.299	.262	.177	.120	.142	.092	.167	.202	.181
Item 3	.260	.299	1.000	.303	.204	.115	.138	.085	.213	.169	.157
Item 4	.254	.262	.303	1.000	.365	.266	.253	.220	.327	.350	.231
Item 5	.202	.177	.204	.365	1.000	.206	.235	.167	.271	.245	.178
Item 6	.102	.120	.115	.266	.206	1.000	.230	.274	.194	.193	.205
Item 7	.161	.142	.138	.253	.235	.230	1.000	.191	.296	.219	.165
Item 8	.099	.092	.085	.220	.167	.274	.191	1.000	.162	.203	.154
Item 9	.224	.167	.213	.327	.271	.194	.296	.162	1.000	.283	.155
Item 10	.275	.202	.169	.350	.245	.193	.219	.203	.283	1.000	.179
Item 11	.107	.181	.157	.231	.178	.205	.165	.154	.155	.179	1.000

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**Reliability Test Depressive  
Symptoms**

Cronbach's

Alpha	N of Items
.926	12

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**Inter-Item Correlation Matrix**

	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Item 12
Item 1	1.000	.767	.502	.589	.508	.512	.393	.380	.494	.458	.409	.453
Item 2	.767	1.000	.508	.636	.518	.532	.415	.379	.523	.479	.430	.484
Item 3	.502	.508	1.000	.574	.481	.520	.490	.464	.502	.458	.496	.480
Item 4	.589	.636	.574	1.000	.550	.605	.511	.430	.572	.528	.512	.601
Item 5	.508	.518	.481	.550	1.000	.657	.480	.384	.599	.482	.411	.538
Item 6	.512	.532	.520	.605	.657	1.000	.538	.432	.631	.567	.483	.612
Item 7	.393	.415	.490	.511	.480	.538	1.000	.507	.616	.567	.525	.625
Item 8	.380	.379	.464	.430	.384	.432	.507	1.000	.503	.471	.459	.477
Item 9	.494	.523	.502	.572	.599	.631	.616	.503	1.000	.670	.512	.640
Item 10	.458	.479	.458	.528	.482	.567	.567	.471	.670	1.000	.504	.613
Item 11	.409	.430	.496	.512	.411	.483	.525	.459	.512	.504	1.000	.558
Item 12	.453	.484	.480	.601	.538	.612	.625	.477	.640	.613	.558	1.000

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