The Impact of Violence Against Women on Child Growth, Morbidity and Survival

Studies in Bangladesh and Nicaragua

KAJSA ÅSLING MONEMI
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Abstract

The aim of this thesis was to explore the impact of physical, sexual and emotional violence against women of reproductive age and the level of controlling behaviour in marriage on child health and survival in two different cultural settings: Bangladesh and Nicaragua.

Data were acquired from four quantitative community-based studies. In two studies, a cohort including a prospective two year follow-up of 3164 mother-infant pairs in rural Bangladesh was investigated. A third study was a case-referent study in Nicaragua including mothers of 110 cases of under-five deaths and 203 referents, and in a forth study an other cohort of 1048 rural Bangladesh women and their 2691 children was followed until 5 years of age.

Maternal exposure to any form of violence, including physical, sexual, emotional, and controlling behaviour was independently associated with lower body size at birth, increased risk of stunting and under-weight at 24 months of age, slower growth velocity during the first two years of life and a higher incidence of diarrhoeal episodes and respiratory tract infections. In the Nicaraguan setting, the children of women who experienced any history of physical violence had a two-fold increase in risk of death before the age of 5 years, and those whose mothers experienced both physical and sexual violence had a six-fold increase in risk of death. In Bangladesh, an association between violence against women and under-five mortality was found among daughters of educated mothers who were exposed to severe physical violence or a high level of controlling behaviour in marriage. In all four studies, lifetime violence experience among participating mothers was high (37-69%), and the timing was less relevant than the exposure to violence per se.

In conclusion, this investigation revealed that violence against women severely affects child health and survival. The findings are especially relevant in a context of high level of child under-nutrition, morbidity and under-five mortality. Efforts for protecting women from all forms of violence are needed as part of the interventions for improved child health.

Keywords: Violence against women, Birth-weight, Child growth, Under-nutrition, Infant morbidity, Under-five mortality, Bangladesh, Nicaragua

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“Violence against women is a paediatric issue”
List of papers

This thesis is based on the following papers which will be referred to in the text by their Roman numerals:

I  Åsling-Monemi K, Tabassum Naved R, Persson LÅ. Violence against women increases the risk of foetal and early childhood growth impairment. A cohort study in rural Bangladesh. Submitted for publication.


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Glossary and definitions

Abuse assessment screen (AAS): A five-question instrument used to screen for violence in pregnancy.

Anthropometry: The technique dealing with the measurements of the size, weight and proportions of the human body.

Case-referent study (= case-control study): A study that starts by identifying people with the event of interest, and subsequently selects controls or reference persons without the event of interest, representing the population which generated the cases.

Case fatality rate: The proportion of cases of a specified condition those are fatal within a specified time.

Child mortality rate: Probability of dying between 1 year and 5 years of age expressed per thousand live births.

Cohort study (= longitudinal or follow-up study): The analytical method of epidemiological studies in which sub-sets of a defined population can be identified who are, have been, or in the future may be exposed or not exposed, or exposed in different degrees, to a factor, or factors hypothesized to influence the probability of occurrence of a given disease or other outcome.

Confidence interval (CI): The computed interval with a given probability, e.g. 95%, that the true value of a variable such as mean, proportion, or rate is contained within the interval.

Conflict tactic scale: The most commonly used instrument (questionnaire) in research into violence against women. It has several subsets of questions for assessing different forms of violence and a behaviourally specific approach.

Cross-sectional study (= prevalence study): A study that examines the relationship between diseases and other variables of interest as they exist in a defined population at one particular time.

Exclusive breastfeeding: The practise of feeding only breast milk, allows the baby to receive vitamins and medicine but other liquids and solid food are excluded

Failure to thrive: Refers to a child whose physical growth is significantly less than that of other children at same age.

Food security: Exist when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy live.

Incidence rate: The rates at which new events occur in a population. The numerator is the number of events that occur in a defined period; the denominator is the population at risk of experiencing the event during this period.
**Infant mortality rate**: Probability of dying between birth and one year of age expressed per thousand live births.

**Low birth weight**: Birth-weight <2500g

**Neonatal mortality rate**: Probability of dying between birth and 28 days of age expressed per thousand live births.

**Parity**: The number of full-term children previously borne by a woman, excluding miscarriages and abortions in early pregnancy but including stillbirth.

**Preterm delivery**: The birth of an infant before 37 completed weeks of gestation.

**Small-for-gestational age** (SGA): Sex specific birth weight 2 SD, or more, below the gestational age-related mean weight.

**Stunted**: Height-for-age Z-score (HAZ) < - 2 SD, in relation to a referent population.

**Under-five mortality rate**: Probability of dying between birth and five years of age expressed per thousand live births.

**Under weight**: Weight-for-age Z-score (WAZ) < - 2SD, in relation to a referent population

**Wasted**: Weight-for-height Z-score (WHZ) <- 2 SD, in relation to a referent population

**Z-score**: (=SD-score) used to express a deviation from the mean value, in standard deviation units; the term is used in analysing continuous variables, such as weight and height.

**Note**: the definitions were derived from JM Last “A Dictionary of epidemiology”, fourth ed. New York, Oxford University Press 2001, and from WHO 2008 (health topics) “definitions”; www.who.int/nutgrowthdb/about.
### Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAS</td>
<td>Abuse assessment screen</td>
</tr>
<tr>
<td>CI</td>
<td>Confidence interval</td>
</tr>
<tr>
<td>HAZ</td>
<td>Height for age Z-score</td>
</tr>
<tr>
<td>HDSS</td>
<td>Health and demographic surveillance system</td>
</tr>
<tr>
<td>HR</td>
<td>Hazard Ratio</td>
</tr>
<tr>
<td>ICDDR,B</td>
<td>International Centre for Diarrhoeal Disease Research, Dhaka, Bangladesh</td>
</tr>
<tr>
<td>IUGR</td>
<td>Intra uterine growth retardation</td>
</tr>
<tr>
<td>LBW</td>
<td>Low birth weight</td>
</tr>
<tr>
<td>OR</td>
<td>Odds ratio</td>
</tr>
<tr>
<td>ORT</td>
<td>Oral rehydration therapy</td>
</tr>
<tr>
<td>RR</td>
<td>Relative risk</td>
</tr>
<tr>
<td>SD</td>
<td>Standard deviation</td>
</tr>
<tr>
<td>SGA</td>
<td>Small for gestational age</td>
</tr>
<tr>
<td>VAW</td>
<td>Violence against women</td>
</tr>
<tr>
<td>WAZ</td>
<td>Weight for age Z-score</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
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<tr>
<td>WHZ</td>
<td>Weight for height Z-score</td>
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Background

Violence against women

Violence against women is a major public health concern and is recognized as a serious violation of women’s human rights.1-4 The United Nations declaration (1993) on the elimination of violence against women defines violence against women as: “any act of gender-based violence that results in, or is likely to result in, physical, sexual or psychological harm or suffering to women, including threats of such acts, coercion or arbitrary deprivation of liberty, whether occurring in public or private life”.5

Terminology

The terminology used in violence research is inconsistent and sometimes confusing and many different terms are used to refer to violence against women. The term *abuse* is frequently in practice as a synonym for violence. *Gender based violence* is defined as “acts or threat of acts intended to hurt or make women suffer physically, sexually or psychologically, and which affect women because they are females or affect women disproportionately”.6 In sociological research, gender-based violence is described as rooted in structural inequality between women and men, and a way for men to excite power and control over women.7-9

*Interpersonal violence* refers to violence implemented by one person or by a small group of people. Interpersonal violence against women could be divided into two subgroups. *Family or intimate partner violence* is when someone in the woman’s own family is the perpetrator and it usually occurs at home. The second form of interpersonal violence is assaults out in the community, when unrelated persons are involved.6 *Wife/spouse/partner abuse* is used interchangeable with intimate partner violence ((Rutherford 2007)).10 The term *domestic violence* is also commonly used interchangeably with intimate partner violence, however, domestic violence sometimes includes a broader definition i.e. any violence between family members.6,10

Violence against women takes many different forms. In a WHO multi-country study on Women’s Health and Domestic Violence against Women3 four different forms of family/intimate partner violence against women were
considered: physical, sexual and emotional violence, and a high level of controlling behaviour in marriage.\textsuperscript{3,11} The different forms of violence frequently overlap.\textsuperscript{3,12-14} Emotional violence refers to insults, humiliations and threats of hurting the woman or someone she cares for (directly or indirectly). Controlling behaviour in marriage is restrictions of woman’s autonomy, constraining her physical and social mobility, causing isolation, and reduced functional capacity in daily life.\textsuperscript{1,3,8} Psychological and mental violence are terms commonly used to describe the same acts and include threats, emotional violence and controlling behaviour, and sometimes economic restrictions for women, such as constrained control over household resources.\textsuperscript{6} Details on the definitions of the four forms of violence assessed in this thesis are given in the method section.

Prevalence and distribution
A WHO multi-country study,\textsuperscript{3} including more than 24,000 women from 10 different countries and 15 study sites determined lifetime experience of physical partner violence among 13-61\% (in most sites between 23-49\%) of ever married women between 15-49 years of age, and lifetime sexual violence among 6-59\%. Lifetime experience of one or more emotionally abusive acts was reported among 20-75\% and controlling behaviour by intimate partners among 20-90\% of women of reproductive age.\textsuperscript{3} Further, 1-28\% of women reported physical abuse during at least one pregnancy.\textsuperscript{3}

The prevalence of violence during pregnancy has been reviewed; Physical violence against pregnant women during the 1980-1990s occurred in 0.9 - 20.1\% of all pregnancies\textsuperscript{15} and between 2001-2006 the prevalence of physical or emotional violence against pregnant women in the US was reported to be 4-8\%.\textsuperscript{16} Many abusive acts are described as severe, as in a Nicaraguan community based study where 70\% of abused women had experienced severe physical or sexual violence.\textsuperscript{12} The same study reveals an early initiation of violence within a relationship; in more than 50\% of violent relationships, violence was initiated within 2 years after marriage.

Violence against women in Bangladesh and Nicaragua
In Bangladesh, different studies in rural areas in early 2000s presented a prevalence of wife abuse between 32-67\%.\textsuperscript{17-19} In the WHO multi-country study,\textsuperscript{3} two sites from Bangladesh were included, and 69\% of the women had at least one experience of any form of partner violence. Lifetime physical violence was reported by 42\% and 12\% had experienced physical violence during pregnancy, 19\% of the whole group of women had been severely physically abused at any occasion in their life.\textsuperscript{3,11}
In a 1995 population-based study in León, Nicaragua, 52% of ever-married women \((n = 360)\) were exposed to physical violence by a current or former intimate partner. Twenty-seven percent of women reported exposure to violence in the 12 months before the interview, and 33% reported that beatings were commonly accompanied by forced sex.12 A community-based study among 478 pregnant women from León20 revealed a prevalence of emotional (32%), physical (13%) and sexual (7%) abuse during actual pregnancy, and among the same women a lifetime prevalence of any violence of 54%.

**Violence against women in Sweden**

Violence against women in Sweden in late 1990s was assessed in a prevalence study21; almost half (46%) of 10,000, 16-64 year-old women had lifetime experience of partner violence, including physical and sexual violence and threats. Further, 2.8% of 1038 women seeking obstetric care had experienced physical abuse the year preceding pregnancy, during pregnancy or shortly after delivery.22 In the same population, lifetime prevalence of physical, sexual or emotional abuse was 19.4%.

**General health consequences**

The negative consequences of intimate partner violence on women’s physical and mental health are well described.3,4,23-26 Violence has both carry-over and cumulative effects27 and long-term consequences might be the most damaging for women’s well being.13 Findings from the WHO multi-country study3 show that the degree of self-reported health impairment among abused women and the strength of the associations are consistent across widely divergent settings.

**Physical health impairment**

Many different forms of physical health impairment related to violence exposure are described. Injuries, including all forms from bruises to homicides, are reported among 19-55% of ever physically abused women and are associated with severe physical violence.3 Among ever-injured women in Bangladesh, approximately 25% report loss of consciousness due to partner violence.3,11 Other commonly described physical conditions are ulcer disease,28 walking problems, chronic pain, vaginal discharge,4,25,28 HIV and other sexually transmitted diseases.16,28

**Mental health impairment**

Different forms of mental and emotional health impairments related to violence exposure include: stress, depression, anxiety, memory loss, dizziness, functional disorders and other mental health problems.3,4,13,23,24 Abused women report increased risk of inability to enjoy life, fatigue and emotional distress.3 In qualitative research (based on interviews with physically and
sexually abused women) from northern Sweden, abused women describe themselves as chronically depressed, extremely weary and living on a day-to-day strategy to endure the situation. In addition, suicidal thoughts and acts are common and post-traumatic stress disorder with flashbacks and long-lasting mental impairment is described among women with a history of violence exposure.

The fear of violence is described to be as dangerous for women’s mental health as the actual physical violence and may increase the risk of severe depression. In at least two thirds of violent acts against women, there is a repetitive and escalating cycle of violence, which includes a first phase of tension building, a second phase including an acute violent act, and finally, a third phase of loving-contrition and absence of tension. The repetitive pattern of violence against women is described by the term *battering or wife battering* and is characterized by its longstanding and continuous character. Moreover, violence against women is related to an increased risk of unhealthy behaviour such as harmful eating habits, increased smoking, alcohol abuse, and illicit drug use.

Reproductive health consequences

Violence usually starts early along a reproductive lifeline. Young girls may be sexually harassed in adolescence as is described in an analysis of women’s situation in South Asia and in an anonymous survey in Nicaragua, where one out of ten young girls reported severe sexual abuse before the age of 13. Adolescent girls may be forced into early pregnancies that increase the risk of pregnancy and delivery complications.

A history of previous victimization often precedes abuse during pregnancy. However, there is no consensus whether pregnancy is a risk factor *per se* for the initiation or escalation of intimate partner violence. Abused women of all ages have diminished possibilities to control their own fertility. Unwanted pregnancies and having many children are more common among women exposed to partner violence and short intervals between pregnancies, rapid repeated pregnancies, are over represented among abused women. One explanation might be that many and close childbirths increase stress on the family, therefore, increasing the risk of family violence. However, contrary to the general opinion described above, findings from a study in Nicaragua suggest a reverse association in that intimate partner violence precedes having many children. Therefore, the high fertility rate among abused women might be a result of male dominance and control.

Violence against pregnant women increases the risk of late entry to prenatal care, which is related to increased risk of pregnancy complications.
Furthermore, violence against pregnant women through different pathways puts the unborn child at risk of negative health consequences, such as a risk of foetal distress, foetal injury, preterm labour and stillbirth\textsuperscript{16,35} and any physical aggression during pregnancy is likely to be directed towards the abdomen.\textsuperscript{20,49}

There is an association between violence against women and increased risk of low birth weight of the offspring.\textsuperscript{16,50-52} A review of 13 studies (from 1982-1997) and a meta-analysis of 8 of them lead to the conclusion that physical, sexual and emotional abuse during pregnancy significantly increases the risk of giving birth to an infant with low birth weight (OR 1.4 CI 1.1-1.8).\textsuperscript{50} A hospital-based case-referent study (n=101:202) in Nicaragua determined physical partner violence against pregnant women increased the risk of low birth weight three times.\textsuperscript{51}

In addition, maternal mortality might be a consequence of partner violence,\textsuperscript{53-55} as found in a community study in Bangladesh, where 14\% of maternal deaths in pregnancy are associated with violence.\textsuperscript{56}

Associated factors

Several different factors increase the risk of partner or family violence and these can be of different character and distance from the women such as; individual, partner-associated, social context and society-associated factors.\textsuperscript{57} However, there are inconsistencies in the findings between different studies, which could be explained by disparities in design and methodology when approaching the topic.

The following characteristics are considered important factors associated with family/partner violence;

\textbf{Age:} younger women particularly 15-19 years old are at higher risk of ongoing partner violence.\textsuperscript{3,58,59} In urban Bangladesh, 48\% of women in the age-group 15-19 years report physical or sexual violence or both during the last 12 months, compared with 10\% of 45-49-year-old women.\textsuperscript{58} This indicates violence usually starts early in a relationship and in some settings older women have higher status than younger.\textsuperscript{3}

\textbf{Education:} low educational level, independent of income level, is associated with increased risk of violence experience.\textsuperscript{3,19,60,61} Education is considered to have a protective effect against violence, as educated women have better status in household and greater autonomy.\textsuperscript{3}

\textbf{Marital status:} Separated or divorced women report a higher lifetime prevalence of all forms of violence than currently married women.\textsuperscript{3} This can reflect that violence is an important reason for ending a relationship, however,
divorced women might be more prone to disclose the experience of violence.³

*Parity:* Violence is more frequent in families with many children.⁴²,⁶²

*Economic resources:* poverty, unemployment, housing problems i.e. strained economic resources increase the occurrence of physical violence against women, although violence is present in all socio-economic strata.¹⁹,⁶⁰,⁶¹

*Habits:* smoking, over consumption of alcohol, the use of illicit drugs and other unhealthy habits are associated with increased risk of physical or sexual abuse.⁶⁰,⁶³,⁶⁴

*Native family:* a history of family violence and witnessing parent’s violent acts are described as one of the most consistent risk factor for violence against women, especially for the abuser.¹²,⁶⁰,⁶⁴

In societies with a high level of economic inequality between men and women, male authority at home and divorce restrictions, women are more physically abused.⁶⁵

**The Offenders**

The offender is, in the majority of all violent acts, the woman’s intimate or former intimate male partner. In the WHO multi-country study including 24,000 women,³ more than 75% of all women who had experienced physical or sexual violence after the age of 15 had been abused by an intimate male partner. Furthermore, 90% of women abused during pregnancy reported the father of the unborn child as the offender. Other offenders are mainly family members such as parents, in-law and siblings.

Literature on marital aggression relies almost entirely on women’s self-reports and women’s reports on male behaviour: few exceptions include interviews with men.⁶⁰ Possessiveness is described as a typical trait of the abuser, meaning that men who abuse their spouses are described as lacking respect for the autonomy of the woman.³,⁶⁶ Data on characteristics of “violent” men in the US indicate that violence is present in all segments of society and four major causal factors are identified: physiological factors (such as stress reactions and alcohol abuse); trauma from abuse as a child; early childhood learning (witnessing parental violence); and lack of communication skills and impulse control.⁶⁷

Studies from Bangladesh, Cambodia and Zimbabwe indicate that even in cultures where male dominance is generally accepted, abusive men control over their partners more than men who do not abuse do.¹⁶,⁶⁸ Moreover, violent acts are not isolated events, but rather a pattern of a behaviour relationship based on domination and oppression.¹⁵,⁶⁹
Children of abused women

Violence exposure

In the 1970-80s, researchers referred to children in households with violence against their mothers as either “witnesses” or “observers” of violence. More recently, those terms have been replaced with the term “exposed” to violence, reflecting the new awareness that family violence directly or indirectly affects children’s health as well as women’s.

Over 50% of women exposed to family violence are mothers of children under 12 years of age. Co-existing physical child abuse is common in families with violence against women. In studies from the US, 30-60% of children in families with ongoing physical violence against women are likely to be abused physically or sexually. In a Nicaraguan population based study, physical child abuse was seven times more common if the mother had a history of violence exposure. Child deprivation and neglect are categorized as forms of violence, i.e. emotional or psychological violence against children. Thus, if any form of violence, also emotional, is considered, 100% of children in families with violence against women are themselves abused.

Factors associated with child abuse are essentially the same as for violence against women i.e. neighbourhood poverty, low-income family, unemployment, parental history of family violence, high alcohol consumption, poor impulse control and social isolation. Further, depression among mothers is described as more common in families with child abuse, which might be a consequence of co-existing violence against women rather than child abuse (i.e. neglect).

Physical health impairment

Growth, nutritional status and morbidity

Few studies address violence against women in relation to child growth or nutritional status. Data from a large survey in India where maternal exposure to physical violence was assessed through one single global question, indicate an increased risk for maternal and child under-nutrition. In addition, results from a hospital-based case-referent study (n=172:345) in Brazil indicate a threefold increase in the risk of severe acute malnutrition in children aged 1-24 months in families with severe and recurrent physical partner abuse, but not in families with only verbal aggression and minor physical assaults.

Investigations assessing violence against women in relation to child morbidity are mainly from high-income countries. In an extensive literature review,
Bair-Merritt et al (2006) revised 94 studies and categorised them into four groups; general health and use of health-services, breastfeeding, failure to thrive, and risk-taking behaviour. Most studies have methodological weaknesses such as small samples, not being community-based (often based on women who seek “shelters” after leaving an abusive partner) or failing to adjust for possible confounders. However, there is evidence to support that violence against women being associated with a risk of lower frequency of immunisation of children and an increase in risk-taking behaviour among adolescents. More recently, in a study of 4000 US women (mostly unmarried) self-perceived impairment of infant health was more commonly reported among mothers exposed to physical partner violence.

The only study from a low-income setting to address morbidity among children of abused women is a cross-sectional survey (n=457 mother-infant pairs) in Uganda, reported that lifetime intimate physical and sexual partner violence is associated with overall infant illness and diarrhoea.

**Mortality**

The few population-based studies addressing violence against women in relation to child mortality report inconsistent results. Two population-based cross-sectional studies from India report a positive relation between physical abuse and neonatal and infant mortality, whereas data from another Asian study could not confirm such an association. In addition, studies from the US have approached women out of hospital or health care settings and suggest an increased risk of perinatal and neonatal mortality among offspring of abused women. Population based data on the impact of sexual and emotional violence, and high controlling behaviour in marriage on child mortality is rare.

**Psychosocial and emotional impairment**

The psychosocial and emotional consequences of children being exposed to family violence have been investigated since the mid 1980s. Studies, predominantly in high-income countries, reveal that children living in families where mothers are exposed to intimate partner violence are at increased risk of negative mental health consequences both short and long-term. Disturbances in emotional and behavioural functioning, social competence, school achievement, cognitive function, psychopathology and general mental health are described as associated to family violence. In a meta-analysis and critique of different studies, forty of 41 studies indicate that domestic violence has a negative impact on children’s mental health.

The age of the child, developmental phase and gender are important in interpreting the effect of exposure to family violence on children’s mental health.
Preschool children show impaired attachment and other emotional problems, as well as posttraumatic stress syndrome. The complexity of family, social and cultural factors means that many of the children’s mental and behavioural problems associated to exposure to violence are understandable if they are viewed as efforts to adapt to a maladaptive situation.

Child health in low-income countries

Table 1. Basic child nutritional and health indicators from Bangladesh, Nicaragua and Sweden in 2006 (year 1990 is indicted for comparison). Source: UNICEF statistics 2008.

<table>
<thead>
<tr>
<th>Child health indicators</th>
<th>Bangladesh</th>
<th>Nicaragua</th>
<th>Sweden</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low birth weight %</td>
<td>22b</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Underweight (&lt; 5 years of age) %</td>
<td>48</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Stunted (&lt; 5 years of age) %</td>
<td>43</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>Exclusively breastfed (&lt; 6 months of age)%</td>
<td>36</td>
<td>31</td>
<td>33</td>
</tr>
<tr>
<td>Neonatal mortality rate 2006ª</td>
<td>36</td>
<td>18</td>
<td>2</td>
</tr>
<tr>
<td>Infant mortality rate 2006 (1990)ª</td>
<td>52(100)</td>
<td>29 (52)</td>
<td>3 (6)</td>
</tr>
<tr>
<td>Under-five mortality rate 2006 (1990)ª</td>
<td>69 (149)</td>
<td>36 (68)</td>
<td>4 (7)</td>
</tr>
</tbody>
</table>

ª per thousand live born children

b ICDDR,B reports 20-37%  

Low birth weight (LBW)

In low-income countries, one out of six newborn infants is of low birth weight (< 2500 gram) and worldwide South Asia has the highest prevalence of LBW (20-35%). Low birth weight could be an outcome of preterm delivery (< 37 weeks of gestational age) and/or a result of intrauterine growth retardation (IUGR). Nearly 80% of all LBW infants in South Asia, and 60% in Nicaragua are born at term, i.e. growth retarded compared with 7-20% in other parts of the world. The proportion of low birth weight
among newborns in Bangladesh, Nicaragua and Sweden are presented in Table 1.

Intrauterine growth retardation might already be established in early pregnancy and is then symmetric i.e. affecting length, weight and head sizes proportionally. Foetal growth is influenced by genetic, medical, nutritional and psychosocial factors, which contribute multi-factorally to LBW. Many risk factors for low birth weight are interrelated and are often a reflection of the underlying poverty. In low-income countries, maternal under-nutrition, with short stature and poor weight gain in pregnancy, is the major contributor to a high prevalence of LBW. Also a modest maternal nutritional deficiency has an effect on the birth weight of the offspring. Other risk factors for LBW are: young maternal age; rapid repeated pregnancies; infectious diseases; unfavourable socio-economic conditions; chronic maternal stress, such as high workload; violence against women (see above); and smoking. Infants with early intrauterine growth retardation living under favourable conditions have a partial growth catch-up during the first 1-2 years of life relative to normal birth weight infants.

The causes of preterm delivery are often unknown but may include; acute and chronic infections, asymptomatic bacteriuria, high maternal blood pressure, multiple birth, hard physical work and other forms of stress, anxiety, and other psychological factors.

Neonatal complications associated with low birth-weight include are multiple and include: impaired thermoregulation, hypoglycaemia, polycythaemia, respiratory distress, intraventricular haemorrhage and necrotising enterocolitis. The risk of neonatal death is estimated to be four times higher for infants with a birth-weight of 2000-2499 g than with a birth-weight of 2500-2999 g, and ten times higher than a birth-weight of 3000-3499 g. The increased mortality risk associated with low birth weight continues throughout the first’s years of life.

Low birth-weight contributes to pervasive early childhood under-nutrition and impaired immune function, which may be sustained throughout childhood. An increased risk of diarrhoeal episodes and acute respiratory tract infections are associated with foetal growth retardation. In addition, foetal growth restriction and subsequent low birth weight is related to increased risk of health impairment in adulthood, such as increased risk of arterial hypertension and cardiac diseases, the “Development Origin of Health and Diseases” or “Barker hypothesis” describes these associations.
Nutritional status the first years of life

Worldwide around 180 million children younger than 5 years of age are undernourished and among them 19 million are severely undernourished.\textsuperscript{111,112} A majority of the undernourished children live in South Asia or sub-Saharan Africa.\textsuperscript{112} Estimations of the prevalence of under-nutrition in Bangladesh, Nicaragua and Sweden are presented in Table 1.

Many different parental and environmental characteristics influence children’s nutritional status: genetic, socio-economic, psycho-social, life-style and feeding behaviour related factors are most commonly discussed in relation to child growth.\textsuperscript{97} Associations between household’s socio-economic conditions and child growth are considered important and can be mediated through food-security (access to sufficient, safe and nutritious food) and feeding practices, incidence of infectious diseases, overall parental psycho-social stimulation and differences in health care seeking behaviours.\textsuperscript{107,113} The importance of childcare and care giving behaviour on children’s nutritional status are discussed in a later section.

Adequate nutrition is the cornerstone for child health and development and under-nutrition is causally related to more than half of all under-five deaths worldwide.\textsuperscript{91,114,115} Undernourished children have considerably lower resistance to infections and are more likely to fall ill in and to die from common childhood diseases such as diarrhoeal and respiratory tract infections.\textsuperscript{108,111,115} Lack of adequate macronutrient and selective micronutrients can lead to immune deficiency and subsequent increased frequency and duration of infections: infants are especially vulnerable because of immature immune system.\textsuperscript{116} The combination of chronic under-nutrition and infection further weakens immune response, leading to altered immune cell populations and generalized increase in inflammatory mediators.\textsuperscript{116}

Under-nutrition especially if occurring during foetal life until two years of age impairs neuronal and mental development.\textsuperscript{117,118} Under-nutrition among infants is strongly associated with less schooling and intellectual performance, and reduced economic productivity, shorter adult height and for women, lower birth weight of the offspring in the next generation.\textsuperscript{109}

**Anthropometric measurements and growth standards**

Anthropometric measurements (most commonly weight, length/height, head circumference, chest circumference and skin folds) are frequently representing nutritional status. Standard deviations or Z-scores (i.e. measurements of variation) are implicated in comparing growth data to a reference population.
Terms commonly used to describe degrees of under-nutrition are under-weight, stunting and wasting (definitions in method section).

In 2005, the WHO multicentre growth reference study group presented new growth references for the first 5 years of life. The new growth standards are constructed from pooled growth data and related information on 8440 healthy children from widely differing ethnic backgrounds and cultural settings (Brazil, Ghana, India, Norway, Oman and US). The criteria included were breastfeeding, good diet, no maternal smoking, supportive environment and adequate healthcare. The new standards, which replaced old references, indicate nutrition, environment and healthcare as stronger factors in determining child growth than gender and ethnic background. Thus, children’s growth patterns under favourable circumstances during the first five years of life are, similar worldwide.

Morbidity
The main causes of morbidity among children, below 5 years of age, in low income countries are communicable disease such as diarrhoeal diseases and respiratory tract infections.

Diarrhoeal disease
Diarrhoea is commonly defined as the passing of three or more stools, per 24 hours, that are liquid enough to take the shape of a container. The average number of diarrhoeal episodes per child and year (< 5 years of age) in low-income countries is 3-4. The majority of diarrhoeal episodes last less than one week and only less than 10% of all diarrhoeal episodes become persistent (last > 14 days). However, persistent diarrhoea accounts for around half of the more severe/fatal cases and is closely related to young age of the infant and degree of malnutrition.

Risk factors for diarrhoeal disease are, aside from deficiency of exclusive breastfeeding, mainly associated with poverty such as poor water quality and sanitation, and the increased risk of diarrhoeal disease among undernourished children is well described. Moreover, there is a reversed causality with frequent diarrhoeal episodes increasing the risk of under-nutrition, creating a vicious cycle. A common and potentially very serious complication of diarrhoea is dehydration due to extensive loss of fluid and insufficient intake. Therefore early interventions by part of the caregivers, with home treatment in form of oral rehydration therapy is often indicated.
Respiratory tract infections

WHO estimates there are 150 million cases of pneumonia each year among children less than five years of age each year, of this 20 million are severe and demand hospitalisation.92,122,131 Studies from low-income countries indicate that acute respiratory tract infections (ARI) are the most prevalent symptom of illness during children’s first years of life.92,131,132 The term “acute respiratory infection” includes both upper respiratory tract infections (URTI) and lower respiratory tract infection (LRTI). Lower respiratory tract infection (LRTI) is frequently used interchangeable to include bronchitis, bronchiolitis and pneumonia, or any combination of the three.133 Pneumonia represents inflammatory conditions involving the lung parenchyma,131,133 and a combination of tachypnea and fever is the most sensitive and specific sign of radiographically confirmed pneumonia in children.135-136 In addition, WHO has developed age-related definitions of tachypnea which are; younger than two months > 60; 2-12 months > 50; and from 1 to 5 years of age > 40 breaths per minute.137

ARI symptoms were present during 12% of observed days in a cohort in Somalia including 403 children less than five years of age, followed for one year.138 Further, in reviews of respiratory infections among children in Asia, the incidence of overall respiratory tract infections (ARI) is described to be 6-9, and pneumonia 0.1-1.2 episodes per person year.131,139 The age group around 12 months of age presents the highest proportion of days with ARI symptoms, which could be related to the on-going weaning process and higher exposure to infectious agents (moving around) in that age group compared to younger infants.138

The risk factors for falling ill from respiratory tract infections are often related with low socio-economic conditions (poverty) such as; crowded living conditions, malnutrition, insufficient breastfeeding, indoor air pollution and cigarette smoke.131,140,141 A vicious cycle is seen in relation of under-nutrition and respiratory tract infections, as described for diarrhoeal diseases.108 Further, boys are more frequently affected than girls are.131,140

Case management of pneumonia, as described in the WHO guidelines for community assessment of different infections,141 has the potential to be extremely effective in decreasing mortality.108,142 Appropriate treatment is described to reduce case fatality from pneumonia by 36% and results in a 24% decrease in overall under-five mortality.142 As home remedies are usually insufficient, treatment of severe respiratory tract infections, i.e. pneumonia, demands treatment and management by the health services.
Mortality

Ten to eleven million children die before the age of five every year, most due to communicable diseases such as diarrhoeal disease and pneumonia.\textsuperscript{92,128} Infant and under-five mortality are sensitive indicators of the socio-economic situation in a country, and an enormous discrepancy exists between child mortality in low-income and high-income countries.\textsuperscript{107,108,143} Moreover, there is strong association between under-nutrition and child mortality: under-nutrition is estimated to contribute to more than 50% of all under-five deaths.\textsuperscript{112,115}

The main causes of under-five mortality in low income countries are: pneumonia 19%, diarrhoea 15%, measles 8%, malaria 7% and HIV/AIDS 3%.\textsuperscript{92,121,144} Forty percent of the annual under-five death occurs during the neonatal period\textsuperscript{92,145} and the main causes of neonatal death are: low birth-weight, prematurity, asphyxia, congenital malformation, neonatal tetanus and other infections.\textsuperscript{145} Further, among death that occurring between 1-5 years of age, different accidents such as drowning are major causes.\textsuperscript{121}

Infant and under-five mortality rates in Bangladesh and Nicaragua have considerable reduced during last decades but are still ten times higher than in high-income countries.\textsuperscript{92} In Sweden, neonatal, infant and under-five mortality rates are the lowest worldwide. The causes of death, in Sweden, in the neonatal period are primary related to prematurity, congenital malformations and delivery complications.\textsuperscript{146} From 1-12 months, sudden infant death syndrome (SIDS) is the most common cause and from 1-5 years accidents such as drowning are the main causes of death, although the number of accidental deaths is much lower than in low-income countries.\textsuperscript{146} Estimations of mortality rates in Bangladesh, Nicaragua and Sweden are shown in Table 1.

The major risk factors for infant, child and under-five mortality and morbidity are associated with poverty and include lack of safe water, poor hygiene and sanitation, crowding, indoor air pollution, insufficient breastfeeding, maternal and child malnutrition and recurrent infections.\textsuperscript{112,143} Further, reproductive characteristics such as short birth intervals, high birth order, very young maternal age at first delivery and older maternal ages at childbirth are also risk factors for infant mortality.\textsuperscript{147-149} There is a positive association between child survival and years of maternal education\textsuperscript{150-152} most likely mediated through improved female status and self-confidence, and better possibilities to comprehend health education messages. In addition, living in rural areas is in many low income countries associated with increased risk of infant mortality, which could be explained by education system and health care systems being less available.\textsuperscript{153}
Discrimination of female children

In parts of the world, the preference for sons has been and is sometimes still prominent. Female child discrimination is manifest in sex selective abortions, neglect, and higher frequency of malnutrition of girls and even as far as infanticide of small girls. Studies from the 1980s present data indicating that over 100 million women are “missing” due to excess female child mortality. Gender bias in infant and under-five mortality has been most pronounced in South Asia including Bangladesh and in some North African countries. Female child mortality decreased from the mid-1980s as the overall under-five mortality decreased worldwide. Nevertheless, in the 1990s, 35% of female deaths (1-4 years of age) in rural Bangladesh were considered due to discrimination and even data from 2003 indicate an excess female infant and under-five mortality in some rural areas.

A literature review of Health and Demographic Survey data from 30 different countries concludes that female child mortality disadvantages appear unrelated to differences in sickness rates, but have a positive association with under-immunization and lower diarrhoeal treatment rates for female children. The disadvantages for girl are largest in the age group 1-4 year, when care related factors are more important to child mortality than congenital or pregnancy related complications. Thus, gender differences in mortality rates for children may be explained by neglect of the needs of small girls, caused by differences in care-seeking behaviour or child-rearing practices.

Female child discrimination is most prominent among ‘better off’ families, as highlighted in Miller’s review of South Asian studies from the 1970-1980s: health care and nutritional discrimination against female children are more common among families with middle to high socio-economic status. Consistent with Miller’s report is a large recent (2002-2003) study in India where 85,633 children were monitored over one year. Gender differences in health care-seeking behaviour are most prominent for educated mothers; children of educated mothers were hospitalised more often and had lower mortality, but most of the benefits of the reduction in mortality and the increase in care seeking was credited to boys.
Child care

Care is a relatively new concept in research, and the theoretical background has emerged from a combination of social sciences, epidemiology, paediatrics and nutrition.\textsuperscript{166,167}

Growth, health and development of a child are closely related to quality of care giving and behavioural interactions between the primary caregiver and the child.\textsuperscript{113,167-169} Child care could be defined as the provision of time, attention, and support to meet the physical, mental and social needs of the growing child\textsuperscript{113} and it refers to behaviours and practices the caregivers use to provide food, clothing, housing, sanitation, protection from danger, stimulation, emotional support, health care etc. for their children.\textsuperscript{166} Care giving includes responding to changing needs and circumstances, in dividing time between the infant and other children (and the husband), and cooking and household chores. Childcare requires ability to cope with stressful challenges such as sleepless nights, feeding problems and illnesses\textsuperscript{170} and hard workloads outside the household.\textsuperscript{171}

The physical and emotional needs of a child are most intense during the first years of life.\textsuperscript{172} The crucial role of the early emotional interactions between a mother and her child, a secure attachment, was first highlighted by Bowlby\textsuperscript{173} and the theory was further developed by Rutter during the 1970-1980s.\textsuperscript{170,172} This “attachment theory” refers to an infant’s need for close emotional bonding to a caregiver (in most contexts the mother of the child) for normal emotional, cognitive and physical development.

The resources a caregiver draws on in giving care include education, knowledge, beliefs, physical health, mental health and self-confidence, as well as autonomy and control over resources in household.\textsuperscript{166} The mother-child interactions are not only associated with maternal characteristics but also with infant characteristics i.e. birth-weight, temperament, irritability and with contextual factors such as stress and social support.\textsuperscript{170,174-177}

Child care and nutrition

Emotional, psychosocial and nutritional childcare is closely interconnected in interactions between caregiver and child.\textsuperscript{166,178,179} A child’s nutritional status is related both with frequency of interactions with the caregiver and quality of interactions.\textsuperscript{166} Different practices related to how food is provided and fed to children influence nutritional intake.\textsuperscript{180,181} Four aspects of feeding behaviour from caregiver are recognized as important.\textsuperscript{166,182} These include: adapting the feeding method to the child’s psychomotor abilities (feeding responsively, including encouraging a child to eat); being affectionate or
warm towards the child; creating a satisfactory feeding situation, which is not distracting the child; and the timing of feeding (including feeding frequently and when the child is hungry).\textsuperscript{166,182}

In paediatric literature from high-income countries, children with “non-organic failure to thrive”, which refers to growth failure without any detectable somatic condition, have been compared to normally growing children and inadequate interaction between caregiver and child is considered the most important background characteristic.\textsuperscript{174,178,179,183,184} Furthermore, studies from low-income countries report insufficient “mothering” among mothers of children clinically under-nourished.\textsuperscript{185}

**Breastfeeding**

Appropriate breastfeeding and weaning practices are essential for infants’ nutritional status and development.\textsuperscript{186-188} Good breastfeeding practices include initiation in the first hour, exclusive breastfeeding for 6 months and sustained breastfeeding up to the second year.\textsuperscript{166,186} Further, timing of weaning and introduction of energy rich complementary food is crucial; either too early or too late weaning may cause negative health consequences for the child.\textsuperscript{188-190} Hence, WHO recommend exclusive breastfeeding for the first 6 months and then gradual introduction of other food while still breastfeeding; preferably up to two years of age.\textsuperscript{191}

In South Asia, initiation of breastfeeding is almost universal, especially in rural areas and among economically disadvantaged mothers.\textsuperscript{190} In studies from rural Bangladesh, 99\% of one-month-old and 93\% of 9-month-old infants are breastfed\textsuperscript{192} and median duration of any breastfeeding is 30 months.\textsuperscript{193} However, early introduction of complementary food is common and only 40\% of one-month-old infants are exclusively breastfed:\textsuperscript{192} the median duration of exclusive breastfeeding is two to three months.\textsuperscript{192,193}

Around one third of Nicaraguan mothers are reportedly exclusively breastfeeding, 9\% have weaned and the rest are partially breastfeeding at 3 months of infant age.\textsuperscript{194} In the same study, women living in households with a female head of household (20\%) are more prone to exclusive breastfeeding than mothers in households with male authorities are.\textsuperscript{194}

**Child care and morbidity**

Care related behaviours such as safe stool disposal, adequate hand washing and food preparation, and other household hygiene procedures are particularly important for reducing the spreading of diarrhoea.\textsuperscript{195,196} The importance of hygiene intervention (e.g. hand washing, water quality treatment, sanitation and health education) has been evaluated and pooled analyses of six
studies of hand washing counselling, suggest a 30% reduction in the risk of diarrhoea, if the care giver practices basic hand washing routines. Gorter et al (1998) present data from a prospective follow-up of 172 families in rural Nicaragua in which 46 “good” hygiene practices (such as hand washing, use of clean utensils, animals chased out of house when entering), were observed, 39 of the practices were associated with lower a risk of diarrhoea.\textsuperscript{197}

Programmes for education on rehydration treatment is provided in households all over the world, and home treatment with “oral rehydration therapy” (ORT) should be initiated before any symptoms of dehydration occur.\textsuperscript{198,199} ORT, when introduced during the 1960s, was labelled the most important scientific discovery in modern time, and still has the potential to save millions of lives.\textsuperscript{108,200} Despite good availability and a general knowledge among caretakers (also in low income settings), the use and preparation of ORT varies considerably.\textsuperscript{198,201,202} In 63-83% of reported episodes of diarrhoeal diseases from Somalia, mothers rely on different home treatment.\textsuperscript{138} In Brazil, no more than 40% of caregivers gave ORT when the indication was there and less than half of caregivers prepared the ORT properly.\textsuperscript{199} To give rehydration therapy is time consuming and requires effort, dedication and motivation from the caregiver. In addition, the unhealthy and dehydrated child is often irritable and fussy and not easily fed.\textsuperscript{166}

The role of the father

In almost all societies the mother of a young child is the primary caregiver, although other family members such as fathers, grandparents, siblings and others can be responsible for a great deal of care giving practices.\textsuperscript{166,203} The father’s role in the family and in childcare varies between cultures, countries and over time. The role can include anything from finding a “good mother” to being highly involved in child rearing and care taking.\textsuperscript{203} Research from high-income countries indicate that father’s involvement in child rearing is related to gender and age of children; involvement decreases with older age and fathers tend to be more involved with sons than daughters.\textsuperscript{60} Furthermore, studies from the US show that the presence of a father, as such, is far less important than the nature of his involvement with the children.\textsuperscript{174} When fathers play a visible and nurturing role in their children’s life, the children have better emotional and social outcomes throughout childhood.\textsuperscript{174,204}

In literature originating from low-income countries, fathers are seldom included in the discussion about childcare and care giving behaviour.\textsuperscript{166,203} Nevertheless, the father’s role and engagement in child rearing are often crucial for children’s health. Fathers are frequently breadwinners and the care given a child is dependent on the proportion of income dedicated towards the children.\textsuperscript{205,206} Fathers are often responsible for decisions concern-
ing the need for health care and purchase of treatment. Furthermore, the supportive role of a husband is important for allowing women the possibility to provide good child care, fathers can buffer if mothers have health-or other problems that influence her relation with the young infant.

The perceived attitudes of husbands are important in the mother’s choice of infant feeding. In a controlled trial (in Italy), teaching fathers how to prevent and manage common lactation problems increased the rate of exclusive breastfeeding five times at 6 months of age. Additionally, if fathers (with better education) are involved in immunization programmes, the timely coverage of vaccinations might increase, as was demonstrated in a community-based study from Ghana.

Violence against women and impaired child health, possible pathways of influence

The overall hypothesis of this thesis was there is an association between family/partner violence against women and impaired child health. This association might be mediated through different pathways and combinations of pathways.

Possible pathways via the intrauterine environment (foetal period)

1. Direct physical trauma: violent acts against pregnant women’s abdomen may lead to foetal injury, preterm delivery, stillbirth and provoke serious bleeding.

2. Stress and depression: all forms of violence against pregnant women may by means of stress and depression increase the risk of low maternal weight gain, impaired foetal growth and low birth-weight. Research on depression has gathered evidence of an association between antenatal depression and retarded foetal growth. Stress and depressions cause disturbance in the hypothalamic-pituitary-adrenal axis, thus, exerting physiological effects upon the intrauterine environment. Increased level of stress-hormones causes constriction of blood vessels, which impair foetal growth and development, among other effects. Stress causes alteration in immunological factors increasing the risk of infections and other diseases, which could impair foetal growth or cause preterm delivery.
As a second step, low births-weight infants have less ability to elicit care;\textsuperscript{224} they are more irritable and have poorer interactions with their mothers than normal birth-weight children.\textsuperscript{225,226}

3. \textbf{Inadequate medical care}: not seeking health care during pregnancy is more common among abused mothers.\textsuperscript{16,35} In addition, several studies have found a strong association between violence against women and delayed entry into prenatal care, which may increase the risk for pregnancy and delivery complications for the woman, as well as for the foetus/infant.\textsuperscript{35,46-48}

4. \textbf{Unintended pregnancies}: unintended (for the women) pregnancies are more commonly reported among abused pregnant women\textsuperscript{38,43,227} and are associated with serious perinatal and neonatal health risks, especially if pregnancies are closely spaced.\textsuperscript{16,228,229}

5. \textbf{Unhealthy behaviour}: insufficient rest or exercise during pregnancy, as well as smoking, alcohol, substance abuse, and eating disorders are more common among abused women.\textsuperscript{16,35} The withholding of food from women, as a form of abuse, is described from India; this might contribute to under-nutrition during pregnancy.\textsuperscript{230}
Possible pathways via care giving (early childhood period)

1. **Physical health impairments:** serious physical injuries caused by direct effects of a violent act are related to more days in bed and to frequent hospital visits (in high income settings)\textsuperscript{231,232} which reduces the abused mothers availability for child care.

2. **Mental health impairments:** stress, depression and anxiety as consequences of violence\textsuperscript{34,24} may reduce the mother’s ability to cope with the everyday needs of a small child, and diminish the quality of different care giving behaviour.\textsuperscript{73,166,179,184} From a review of research on depression, there is a clear association between maternal depression and deficiencies in child care.\textsuperscript{233} Women with depression might have difficulties in expressing positive attitudes towards their infants and present emotional detachment and distress.\textsuperscript{174,184,207} In addition, mothers with a history of abuse are less emotionally available and more intrusive towards their 5-months-old infants.\textsuperscript{234}

Depression, stress and other mental health impairments among mothers can lead to growth failure for their children.\textsuperscript{179,185,235-237} In a community based cohort (n=632) in rural Pakistan, infants of depressed mothers were more often stunted and underweight at 2, 6 and 12 months of age, than infants of non-depressed mothers.\textsuperscript{215} Similar findings are described in longitudinal fol-
low-up of poor Indian women (n=171), where maternal depression increased the risk of under-nutrition of infants at 6-months. Furthermore, maternal antenatal depression increases the incidence of diarrhoeal episodes and incomplete immunization among infants.

Breastfeeding, weaning and different hygiene practices are affected by the mother’s mental health. Past or current abuse can lead to breastfeeding cessation and the very experience of breastfeeding can be affected by violence experiences. However, in a large population-based study on US women, exposure to intimate partner violence did not influence breastfeeding behaviour, and in a case-reference study, no differences among abused and non-abused women in breastfeeding duration were found.

Mentally stressed and depressed women are described to be less concentrated on health educating messages from community or health services, as highlighted in a sample of 180 Bangladeshi mother-infant pairs, where mothers who experience less stress benefit more from health education messages such as exclusive breastfeeding counselling.

3. Diminished autonomy and reduced control over resources: abused women have less possibility for decision making in the household, decreased freedom of movement in society and high economic dependency. Findings from a study in India show a strong association between domestic violence and women’s inability to make decisions for herself and her family including the choice of infant feeding. Women may have responsibility for childcare and rearing without control over resources to carry out that responsibility. The mother’s degree of autonomy and her influence on resource allocation in the household are important determinants of child growth. Income earned by women is more often allocated for immediate benefit of children, such as for purchasing food, than income earned and controlled by men is.

4. Social isolation and lack of social support: violence is often accompanied by social isolation and feelings of powerlessness. Social support for the mothers’ is important for the quality of care given to a child. Support from other family members may influence the quality and the amount of care provided, both directly through freeing up mothers time and indirectly through influencing the mother such as reducing her stress. Good social relations promote confidence and positive feelings towards the infants and reduce infant under-nutrition. Moreover, mothers who experience a high level of stress or who react more to stress, may find it difficult to engage in social life or may perceive external support as unnecessary.
5. Insufficient health care seeking behaviour: from a sample (n=209) of high risk mothers in Alaska, mothers who disclosed intimate partner violence were less likely to report a regular site for medical child-care or a primary paediatric provider. Children of mothers with experience of milder partner violence had lower rates of hospitalisation than children of non-abused mothers had. However, other studies suggest abused women bring their children to preventive health care visits, but the visits do not occur at recommended time intervals. Several explanations for inadequate health care seeking behaviour in relation to violence exposure need to be considered. The first is related to mothers’ mental health and her lack of energy to take action, the second is the possibility that women exposed to partner violence may be hindered, by the offender, from seeking health care or other sources of external support for their children.

Rationale for this research

Literature on the consequences of violence against women on children physical health is limited and the few studies presented have methodological limitations. Furthermore, earlier focus has been on the consequences of physical and/or sexual violence; whereas, this project also includes emotional violence and the level of controlling behaviour in marriage as important aspects. In order to evaluate the magnitude of public health consequences, WHO has asked for basic knowledge in the field of violence against women in relation to child health.

To provide unique possibilities for studying the potential health effects of violence against women on their offspring, this research project:

- Only includes community-based samples,
- Approaches the study subject with one case-referent and three longitudinal epidemiological studies,
- Carefully adjusts for potential confounding factors, and
- Includes large sample sizes of (2691-3164 children) in the follow-up studies.
Aims of the thesis

The overall aim of this thesis was to assess the effect of family violence against women on child health and survival in two different cultural settings, Bangladesh and Nicaragua.

Specific aims

- To analyse whether different forms of family violence against women are associated with infant’s size at birth and early childhood growth in rural Bangladesh (Paper I).

- To investigate if different forms of family violence against women are associated with incidence rates of diarrhoeal and respiratory tract infections among infants in rural Bangladesh (Paper II).

- To assess if different forms of family violence against women are associated with increased mortality risks of offspring before 5 years of age in two different communities: Nicaragua and Bangladesh (Papers III and IV), and to evaluate whether such associations, if present, differed with the mother’s socio-economic status (i.e. educational level) and gender of child (Paper IV).
Subjects and Methods

Study areas
The studies were performed in two different study areas, in South Asia and the other in Latin America, representing different ethnical, religious and cultural contexts.

Bangladesh (Studies I, II and IV)
Bangladesh, situated on a large delta in South Asia, is one of the most crowded countries in the world with a population of 150 million. Life expectancy is 62.4 years (2006) and mean fertility 3.1 (2006) live births per woman. Poverty is pervasive especially among the 85% rural inhabitants who live as subsistence farmers and day labourers in a harsh environment with frequent floods and cyclones, which jeopardise the harvests. A majority of the population is Muslim (85%), the rest mainly affiliated to Hinduism. The official language is Bangla (also called Bengali), but English is widely spoken in upper class and politics.

The study site is the Matlab field station located in a regularly flooded part of rural Bangladesh, which is intersected by a network of tidal rivers. The area covers 140 villages and has a rural population of 220,000. The economy is dominated by agriculture production with a high level of landlessness. Adult illiteracy level was 30-50% in the study populations. Community health workers, responsible for around 400 households each, provide immunisation, family planning and first line treatment for infectious diseases at the household level. More complicated illnesses are referred to health care sub-centres, and next level of health services is the Hospital in Matlab.251

Gender relations in Bangladesh are highly skewed in favour of males. This is manifested in early marriage of girls and once married, a woman usually moves into her husband’s household and loses the support network of her native family.36
**Nicaragua (Study III)**

Nicaragua, in the centre of Central America, has a population of 5.7 million (2006) and an overall life expectancy of 70.1 years in urban areas and almost 10 years shorter in rural areas. The mean fertility is 2.7 (2006) live births per woman. Around 75% of the population lives in poverty (one or more basic need unsatisfied), and more than half of the poor live under conditions of extreme poverty. Sixty percent are affiliated to Catholicism, the rest of the population to other Christian denominations, and the official language is Spanish (spoken by 90%).


The study site lies in the urban and rural districts of the municipality of León, the second largest city in Nicaragua with a population of 200,000. In the past, León was a centre of cotton production but after the collapse of the cotton industry in 1992, and after two major natural disasters during the early 1990s (volcanic eruption and tsunami) unemployment and poverty has been prominent in the area. At the time of the study, the population had an adult illiteracy level around 25% (Ellsberg 2000). Health services are provided at two levels: primary healthcare (Centro de salud and Puesto de salud) and at the second level at the University Regional Hospital of León (HEODRA).

The lives of most Nicaraguan women are still formed by traditional values regarding appropriate gender roles, early marriages and numerous pregnancies, even though the revolutionary period in the 1980s involved many women in activities outside family and household.

**Study designs and study populations**

This thesis was based on four quantitative community based epidemiological studies with different designs, cohort and case-referent studies. The research infrastructure was well established in both study sites.

**Cohort studies (Papers I, II and IV)**

In Matlab, Bangladesh, a health and demographic surveillance system (HDSS) covering a 200,000 population has been running since the mid-1960s. Demographic data are collected in the households on a monthly basis, by community health workers, and include updating births, deaths and causes of death, marriages and migration. A unique identifying system allows every individual to be tracked over time. In the area, around 2300 live births are registered annually.
Prospective cohorts (Paper I and II)

Studies I and II were performed in Matlab, within the health and demographic surveillance system (HDSS) area. In a randomised trial, the “MINI-Mat-study” (Maternal and Infant Nutritional Intervention in Matlab), all women becoming pregnant (n=4436) between November 2001 and October 2003 were invited to participate. At around 9 weeks of gestation, the women were randomised into six equally sized intervention groups. The groups were given different combinations of supplements of Fe, folic acid, or a multiple micronutrients and each group were combined with either early (from first trimester) or late (from second trimester) start of food supplementation. In addition, the women participating were randomised to either counselling for exclusive breast-feeding or a different health education message of equivalent intensity. The aim of the overall MINIMat-study was to study whether different energy and micronutrient supplementation increased size at birth and accordingly reduced child mortality.253

Studies I and II were embedded into the main MINIMat-project and included a follow-up of live born children of participating women. Of 3558 registered singleton life births, 394 were excluded or lost from follow-up due to incomplete data or out-migration (see Paper I for details). Thus, study I included a cohort of 3164 live-born singletons with complete maternal violence data and anthropometry registered at birth, and study II consisted of the same study population, apart from the 32 neonatal deaths (that had no morbidity recall at all). For study I, the follow-up period was until children completed 24 months and up to 12 months for study II.

Cohort (Paper IV)

Study IV was also performed in Matlab, Bangladesh. In study IV, data from the HDSS were linked to an other data source including women from the same population; the survey on Women’s Health and Domestic Violence against Women conducted in Bangladesh in 2001, which was a part of the WHO Multi-Country Study on violence against women.3,11 A sub-sample of the survey participants, the ever-pregnant rural women (n=1326), was chosen for the secondary data analysis. From final analysis, 145 women were excluded, as they did not have any live births during the follow-up period and 133 women with incomplete data concerning survival of the offspring. Thus, the final sample consisted of 1048 women and their 2691 singleton live births: the study period was defined from July 1, 1982 until June 30, 2001. The follow-up period for each child was until five years of age (or death, or out-migration).
Case-referent study (Paper III)

A Nicaraguan-Swedish research collaboration on reproductive and child health was initiated in early 1990s. In 1993, a survey was conducted and included 50 (out of 208) randomly selected geographical clusters, covering urban and rural households in the municipality of León. Three years later, the households were revisited and demographic data updated. From this database, consisting of 9500 households, including information about birth, death, migration and socio-economic conditions, several sub-studies emerged. The case-referent study presented in Paper III was one of the sub-studies.

Cases were defined as children born alive to women in the database and who died before the age of 5 years, between January 1993 and June 1996. For each case, two referents, matched for sex and age (at time of case’s death), were selected from the population database. Initially, 156 children, identified as potential cases, were matched to 312 referents. After excluding stillbirths (24), out-migrated (15), refusals (4), mothers who were mentally retarded (3), and 16 mothers of referents who could not be located and one who refused to be interviewed, the final sample consisted of 110 mothers of cases and 203 mothers of referents.

Table 2. Characteristics of the studies on which the thesis is based

<table>
<thead>
<tr>
<th>Paper No</th>
<th>Problem Approached</th>
<th>Study design</th>
<th>Study population</th>
<th>Study period</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (Bangladesh)</td>
<td>Family violence in relation to size at birth and growth from birth- 24 months of age.</td>
<td>Prospective Cohort</td>
<td>3164 mother-child pairs 45 561 anthropometric measurement</td>
<td>November 2003- June 2006</td>
</tr>
<tr>
<td>II (Bangladesh)</td>
<td>Family violence in relation to infant morbidity; diarrhoea and ARI from 1-12 months of age.</td>
<td>Prospective Cohort</td>
<td>3132 mother-child pairs 234,695 person-days of recall</td>
<td>November 2003- June 2006</td>
</tr>
<tr>
<td>III (Nicaragua)</td>
<td>Family/partner violence in relation to infant and under-five mortality</td>
<td>Case-referent study</td>
<td>110 cases, 203 referents</td>
<td>January 1993- June 1996</td>
</tr>
<tr>
<td>IV (Bangladesh)</td>
<td>Partner violence in relation to under-five mortality, including gender differences</td>
<td>Cohort</td>
<td>1048 mothers, 2691 children</td>
<td>July 1982- June 2001</td>
</tr>
</tbody>
</table>
Data collection

In all four studies, data were collected through verbal interviews and most took place at the women’s homes or close environment (backyards etc.): for studies I-II, violence data collection was at health service units, but always in privacy. The fieldworkers were trained in interview technique in order to improve comprehensibility and quality. All questionnaires were translated from English into the local language (Bangla and Spanish) and pre-tested in the cultural context.

Prospective cohort studies (Studies I and II)

A team of female paramedics were trained to perform violence interviews with pregnant women in the third trimester. Women were interviewed following WHO ethical guidelines on conducting domestic violence research. Anthropometric measurements and morbidity recalls were undertaken by a separate team of 30-40 male and female fieldworkers who had been well trained by ICDDR,B field organisation. The anthropometric equipment used was checked and calibrated on a daily bases. A birth notification system was established to ensure that study staff was aware of births as soon as they occurred. The aim was to perform anthropometric measurements within 72 h of birth.

Instruments used:

1. Physical, sexual and emotional violence and the level of controlling behaviour was assessed by a shorter and slightly modified version of the questionnaire used in study IV, i.e. based on the Conflict Tactic Scale (see below).

2. Asset score: household economic status was measured by constructing a wealth index of asset ownership. This instrument was constructed, and validated in India and Pakistan by Filmer and Pritchett (2001). Scoring factors include ownership of specific items such as a bicycle and radio. The score include information on drinking water source, sanitary conditions, number of rooms etc. Each household was assigned a standardised score that differed depending on whether or not the household owned different assets. The scores were then ranked in quintiles. The scoring differs markedly across the poor, middle and rich households and is robust to the asset included: there are disadvantages when comparing rural and urban areas.

3. Anthropometric data (study I): adjustments were done in order to be able to correct for delay in anthropometric measurements at birth. Data from these infants were plotted separately for each sex and interpolation was used
to develop a SD for each day during the neonatal period and then extrapolated to birth data out of group data.\textsuperscript{253}

Throughout the follow-up, child weight and length was measured every month during the first year of life and then every third month until the child had completed two years of age. Weight was measured by electronic and beam scales, with maximum measurement error of 10g (baby scales SECA Ltd, Birmingham, UK). Locally manufactured two-track wooden length boards were used for supine length measurements, with a maximum measurement error of 1 mm.

4. Morbidity data (study II): once a month the mothers were asked for a seven-day recall on infant’s illness. Fixed alternatives of the following common symptoms of illness were given: fever, cough, breathing difficulties, and loose stools. Each section ended with additional open questions. If the infant had presented any cough or breathing difficulty, additional questions were asked on the presence of rapid breathing and chest indrawings.

5. Breastfeeding habits were assessed with monthly maternal recalls on the practice of exclusive breastfeeding or not, and timing of introduction of complementary feeding.

Cohort study (Study IV)

Results presented in Paper IV are from secondary data analysis from two different sources. During the 19-year-long study period, the demographic data from the HDSS database was continuously collected on a monthly basis by community health workers. Each health worker is responsible for around 400 households and is trained by the ICDDR, B field organization. The violence data were collected by female fieldworkers, after a 16 days introduction and training course, and followed the guidelines established for the whole multicounty WHO study.\textsuperscript{3,11}

Instruments used:

1. Physical, sexual and emotional violence and the level of controlling behaviour in marriage was assessed with a standardised pre-tested questionnaire based on the Conflict Tactic Scale (CTS) developed and validated by Straus et al (1996).\textsuperscript{255} The Conflict Tactic Scale is the most widely used instrument for assessing family violence and contains many sub-scales measuring verbal and physical aggression: it is characterised by questions being direct and behaviourally explicit. The CTS has detected women whom have experienced acts of violence but do not necessary identify themselves as abused.\textsuperscript{57} The same study protocol, with some local adaptations, as in study
II, was used in the other nine countries included in the WHO multi-country study on Women Health and Domestic Violence against women.3

2. Asset score was used to construct a wealth index as an estimation of a households’ economical status, in the same way as in studies and II.

3. Gender roles: attitudes toward gender roles were evaluated through presentation of five statements reflecting conventional gender roles and responsibilities, and women were asked whether they agreed or not. Attitudes towards gender roles were scored by adding the five items.3 These statements were:

1. A good wife obeys her husband even if she disagrees with him.
2. It is important for a man to show his wife who is the boss.
3. Women should be able to choose her own friends even if her husband disapproves.
4. It is a wife’s obligation to have sex with her husband even if she does not feel like.
5. If a man mistreats his wife, others outside of the family should intervene.

Case-referent study (Study III)

Four trained female Nicaraguan fieldworkers conducted interviews with the mothers in strict privacy. The fieldworkers were encouraged to take notes on everything the mother said outside the structured questions and these notes were then compared to the answers on the questionnaires in order to check for consistency. Almost all interviews were performed on two different occasions, as the questionnaire covered many items and were time consuming (1-3 hours per interview). There were benefits in revisiting the women as it created confidence, and in only three interviews was the second part impossible to perform.

In order to reduce interviewer related bias, both the mother of a case and the mothers of the corresponding two referents were interviewed by the same fieldworker. Frequent meetings were held between the fieldworkers and one of the supervisors in order to revise questionnaires, and to discuss inconsistencies and problems in the field.

**Instruments used:**

1. Physical and sexual violence against women was assessed through two groups of questions. The first set of questions assessed lifetime experiences of physical and sexual violence by any person. Women with experience of violence were further questioned, the second set of questions were about the perpetrator, the frequency, timing and severity of the violent acts, and how much they felt the violence had affected their emotional well being. The
questions were based on a modification of the “abuse assessment screen” AAS, a short and simple clinical assessment screen (see Paper III for details), which was evaluated by McFarlane et al (1992) on a US female population.256 The third author (M. Ellsberg), who was previously responsible for a survey on domestic violence among 488 Nicaraguan women,12 evaluated and pre-tested the violence part of the questionnaire.

2. A verbal autopsy for assessing causes of death was based on a standardised set of criteria to identify neonatal, infant and child death and was used and validated in India.257 Different categories of criteria were defined as essential, confirmative and supportive for the diagnostic procedure. The mother was asked to answer yes or no to different questions regarding symptoms of illness preceding death. The advantage of this instrument is the possibility of defining causes of death occurring outside health care services and without the presence of medical personnel.257 Furthermore, as a comparison, mothers were encouraged to “tell their own story” about the time preceding the child’s death. Both the structured verbal autopsy questions and the narrative descriptions were assessed by the first author (paediatrician) and by a paediatrician from the local hospital, the diagnosis was determined through a consensus process.

3. The “unsatisfied basic needs assessment index” was used to estimate the household’s socio-economic status; it includes access to a series of basic indicators, such as water sources, sanitation, housing quality, school enrolment among minors and dependency ratio. Households lacking one indicator were classified as poor and those lacking two or more unsatisfied needs were considered extremely poor. This instrument was evaluated by Boltvinik and adapted to Nicaraguan situation by Renzi and Agurto.258,259 The population survey in 1996 included this assessment, which was then used when analysing the case-referent study data.

Definitions

The following definitions were used in the questionnaires and analysis:

**Violence**

*Physical violence*: intentional use of physical force with the potential for causing death, injury or harm.

*Moderate physical violence*: slaps, throwing something that hurt, and pushing or shoving.

*Severe physical violence*: hitting with fist or something else, kicking or dragging or beating up, choking or burning, and threatening or using a gun, knife or other weapon.
Sexual violence: physically forced to have intercourse, or intercourse out of fear of what the husband might do, or forced to do something sexual that she found degrading or humiliating.

Emotional violence: exposed to any of the following: insults; humiliation or belittlement in public; intimidation or scaring on purpose; and threats to hurt her or somebody she cares for.

Controlling behaviour in marriage: whether husband
1. Restricts her contact with native family.
2. Restricts her contact with friends.
3. Insists knowing where she is all the time
4. Ignores her or treats her indifferently
5. Expects her to seek permission for seeking health care for herself
6. Is constantly suspicious that she is unfaithful
7. Gets angry if she speaks with another man.

The seven control items were included in study IV, and items 1, 2, 4, 6 and 7 were included in studies I and II.

Physical and sexual violence was considered in all four studies, and emotional violence and level of controlling behaviour in marriage in studies I, II and IV. Lifetime experiences of violence included any experience of violence from 15 years of age until the time of the interview in studies III and IV, and any violence ever (also during childhood) in studies I and II. Current violence was defined as experience of violent acts during 12 months preceding the interview, and pregnancy violence as violence during the time the woman was pregnant, any pregnancy or a specific pregnancy. Initiation of violence: when the first violent act ever occurred was assessed in study IV, but not in the other studies.

The same definitions of forms, severity, and timing of violence exposure were used in all four studies, but they included slightly different possible perpetrators:
- Studies I and II included unspecified family violence (i.e. intimate partner, in-laws, parents and other family members) as possible perpetrators.
- Study III included intimate partner violence and other perpetrators (family members and unrelated others) separately.
- Study IV included only intimate partner violence.

Anthropometrics

- Height-for-age Z-score (HAZ) was used to describe linear growth. Stunting, which is an indicator of chronic malnutrition, was defined as HAZ <-2 SD and severe stunting as HAZ <-3 SD.
• *Weight-for-age* Z-score (WAZ): under-weight was defined as WAZ <-2SD and severe under-weight as WAZ <-3 SD, indicating chronic and/or acute malnutrition.

• *Weight-for-height* Z-score (WHZ): wasting was defined as WHZ <-2SD and severe wasting as WHZ <-3SD, and that indicative for acute weight loss or failure to gain weight associated with acute infection or temporal food shortage.

**Morbidity**

Morbidity was assessed according to the mother’s own estimation or perception without any measurements required.

• A *diarrhoeal diseases* episode was defined as three or more abnormally liquid stools per 24 hours.

• *Acute respiratory infection* (ARI) was defined as cough or breathing problem with fever.

• *Lower respiratory tract infection* (pneumonia) was defined as cough or breathing problem with rapid breathing and fever.

**Data quality control**

Data quality assurance-mechanisms were used at several points during the research processes. All questionnaires were carefully reviewed by field supervisors, checked for missing data and inconsistencies, and returned to the field for correction when needed. Randomly repeated interviews and measurements occurred in around 5% of participants; these controls were conducted by the more experienced fieldworkers or field supervisors. Data were entered and checked by trained personnel under continuous supervision by a principal researcher. Data quality was further controlled by logical data controls in the computerised data files.

During the study period regular meetings were held with fieldworkers in order to increase quality of collected data and as an opportunity for debriefing and feedback to the fieldworkers themselves.

**Data analysis**

Primary descriptive analysis was by SPSS (studies I, II and IV) and EpiInfo (study III). In all four studies, the individual child was the unit of analysis. Chi-square-test and ANOVA compared group differences within the datasets. Multi-variate models were developed to evaluate if the different forms
of violence against women were independently associated with the outcomes analysed.

There was careful adjustment for possible confounders in all four studies. Any co-factor with a p < 0.20 for any linear or non-linear association with the outcome was initially included in the statistical model; however, if the influence of the measured variable on the effect estimate was less than 5%, it was excluded from the final model. The confounding factors considered in the analysis were: maternal age, birth order of child/parity, maternal educational attainment, household economic situation, place of residency (study III), religion (studies I, II, IV), maternal weight (studies I, II), birth-weight (studies I, II), duration of exclusive breastfeeding (studies I, II) and maternal intervention groups (studies I, II).

In study I, anthropometric data were converted into Z-scores with ANTHRO 2005 software (WHO 2006). A model for evaluating the association between mother’s exposure to violence and child growth was constructed with general linear model technique. Data were analysed with the Statistical Package for Social Sciences (Version 12.01; SPSS Inc, Chicago).

In study II, incidence rates of morbidity symptoms for different groups or time intervals were calculated with the Statistical Package for Social Sciences (Version 12.01; SPSS Inc, Chicago). The relative risk of falling ill was analysed in relation to maternal exposure to violence through individual episode counts as outcome variables and person-time observed as rate multipliers in Poisson regression models, EGRET (Version 2.0; Cytel Software Corporation, Cambridge, USA).

In study III, bi-variate and multi-variate odds ratios for infant and under-5 mortality were calculated with matched analysis. Conditional logistic regression analyses used the EGRET (Version 2.0; Cytel Software Corporation, Cambridge, USA).

In study IV, under-five mortality rates were calculated with Kaplan-Meier survival tables, and a model for evaluating the risk for under-5 mortality was constructed with life table technique, survival analysis with Cox regression. Both analyses were with the Statistical Package for Social Sciences (Version 12.01; SPSS Inc, Chicago). In order to adjust for multiple live births to single mothers (cluster effect), the effect of violence exposure on under-five mortality was evaluated by logistic regression, with a generalized estimating equation (GEE) model in Strata software.
Ethical considerations

Studies I and II, the MINIMat-study: Permission was obtained from the Ethical Review Committee at ICDDR, B, Dhaka, Bangladesh.

Study III: Ethical review and clearance were obtained from the Medical Faculty, University of León, Nicaragua, and the Research Ethics Committee of the Medical Faculty, Umeå University, Sweden.

Study IV included secondary analysis of data from two already existing databases (no identifiers were included). Permission for the original study on violence against women and for data linkage for secondary analysis was obtained from the Ethical Review Committee at ICDDR, B, Dhaka, Bangladesh.

In all four studies, informed consent was obtained from each women participating, and at community level through meetings with local health organizations and community representatives. All four studies were performed in accordance with the WHO ethical and safety guidelines on the conduct of domestic violence research. The Nicaraguan study (Paper III) was conducted before the WHO guidelines were published; however, third author (M. Ellsberg), who also was one of the fieldwork supervisors, was subsequently involved in formulating the WHO guidelines.

The WHO guidelines on domestic violence research emphasise the importance of ensuring confidentiality and privacy, both as a means to protect the safety of the women interviewed and the fieldworkers performing the study. The research team members were carefully selected and they received special training and support. The exact issue of the interviews was only revealed to the participating women: at household and community level, the investigations were presented as studies on women’s health and life experiences. The studies included actions aimed at minimizing any possible distress caused by the research. All interviews were conducted in a non-judgemental manner Data were handled with strict confidentiality and only the small group of research-team members had access to the data. No identifying information about respondents was used in study reports or papers.
In study III, all women and children participating were offered assistance and counselling by professional health workers. Further, all physically and sexually abused women were offered mental health counselling services in study IV. The same was done in study I and II as long as funds allowed. Because of the sensitivity of the issue, regular debriefings (on weekly basis) were held with the fieldworkers who performed the interviews.

Research collaboration

The first, second and fourth studies were performed within the research collaboration between Public Health Sciences Division, International Centre for Diarrhoeal Disease Research (ICDDR,B), Dhaka, Bangladesh and International Maternal and Child Health (IMCH), Department of Women’s and Children’s Health, Uppsala University, Sweden.

The third study was performed within the bilateral research collaboration between the Department of Preventive Medicine, Universidad Nacional Autónoma, León, Nicaragua, and the Division of Epidemiology, Department of Public Health and Clinical Medicine, Umeå University, Umeå, Sweden.
Results

In this section, the main findings across the four papers will be summarised. The findings highlighted important consequences of violence against women on different child health outcomes. Detailed results can be found in the individual papers.

Characteristics of the women

All women participating in the studies were of reproductive age. Some characteristics between women from the two settings differed. In Bangladesh more than 80% were Muslims, and in Nicaragua most participants were Catholic. Fifteen percent of the Nicaraguan mothers were single, but only very few women from Bangladesh were. Further, 80% of the Nicaraguan women lived in an urban neighbourhood, whereas, all women included in the studies in Bangladesh were from rural areas. In studies I and II, 34% of the women had less than three years of formal education, in study IV 52% of the population had very low or no schooling at all and in study III, this was 14%. However, there were also similarities in basic characteristics, such as, living under demanding socio-economic conditions and having many children.

Patterns of violence exposure

Studies I-II: 50% of women had lifetime experience of any form of family violence and 22% reported lifetime experience of physical violence. A lower prevalence of violence exposure was reported among women participating in studies I-II than in study IV, despite being similar study populations and from the same rural area in Bangladesh. This was also true for the pregnant women in study IV (n=98), who had almost the same mean age (mean age 25) as the women in studies I-II (mean age 26 years).

Study III: Sixty-one percent of mothers of cases had a lifetime experience of physical and/or sexual violence compared with 37% of mothers of referents (representing the population). More than 80% of all violence against women was intimate partner violence (for mothers of cases 84%, and for mothers of
referents 89%). Among women reporting physical violence, 90% was classified as severe.

Study IV: Two thirds of women had experience of any form of partner violence during their lifetime and 42% reported lifetime physical violence. There was considerable overlap between the four different forms of violence. Physical violence was commonly initiated shortly after marriage; 67% of women being physically abused reported the first episode within a year and 86% within 5 years. In table 3, the prevalence of violence exposure among 98 pregnant women included in study IV is also given (within parenthesis), unpublished data.

Table 3. Prevalence of exposure to different forms of violence against women reported in the four studies included in the thesis. In studies I, II and III were family violence included, in study IV was only intimate partner violence included.

<table>
<thead>
<tr>
<th>Violence exposure</th>
<th>% exposed</th>
<th>Studies I-II n=3164/3132</th>
<th>Study III n=203</th>
<th>Study IV n=1048 (n=98)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any violence a</td>
<td>50&lt;sup&gt;b&lt;/sup&gt;</td>
<td>37</td>
<td>69</td>
<td>(65)&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Physical violence a</td>
<td>22&lt;sup&gt;b&lt;/sup&gt;</td>
<td>36</td>
<td>42</td>
<td>(32)&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Sexual violence a</td>
<td>24&lt;sup&gt;b&lt;/sup&gt;</td>
<td>10</td>
<td>50</td>
<td>(57)&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Severe physical violence a</td>
<td>8&lt;sup&gt;b&lt;/sup&gt;</td>
<td>30</td>
<td>19</td>
<td>(9)&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Physical violence during pregnancy</td>
<td>8&lt;sup&gt;b&lt;/sup&gt;</td>
<td>12</td>
<td>12</td>
<td>(7)&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Emotional violence a</td>
<td>28&lt;sup&gt;b&lt;/sup&gt;</td>
<td>-</td>
<td>30</td>
<td>(30)&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>High level of Controlling behaviour a</td>
<td>18&lt;sup&gt;b&lt;/sup&gt;</td>
<td>-</td>
<td>22</td>
<td>(22)&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> lifetime exposure, <sup>b</sup> pregnant women
Characteristics associated with violence exposure
The following characteristics (maternal or child related) were positively associated with violence exposure among women:
- Low maternal educational level (studies I, II, III, IV)
- Multiparity/high birth order of child (studies I, II, III)
- Older maternal age (studies I, II)
- Poverty (studies I, II, IV)
- Religion (studies I, II, IV, not relevant for study III)
- Low maternal weight (studies I, II, not relevant for studies III, IV).

Foetal and early childhood nutritional status

Table 4. Mean values for weight (kg), length (cm), weight-for-age (Z-score), height/length-for-age (Z-score), weight-for-height/length (Z-score) of all children included in study I at different ages. Values for boys and girls respectively are shown within parenthesis (Study I).

<table>
<thead>
<tr>
<th>Age (months) n=3164</th>
<th>Weight (kg) all (boys/girls)</th>
<th>Length (cm) all (boys/girls)</th>
<th>WAZ all (boys/girls)</th>
<th>HAZ all (boys/girls)</th>
<th>WHZ all (boys/girls)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2.70 (2.74/2.65)</td>
<td>47.8 (48.1/47.5)</td>
<td>-1.37 (-1.36/-1.38)</td>
<td>-0.93 (-0.95/-0.91)</td>
<td>-1.03 (-1.02/-1.04)</td>
</tr>
<tr>
<td>3</td>
<td>5.30 (5.52/5.06)</td>
<td>57.8 (58.6/57.1)</td>
<td>-1.20 (-1.23/-1.17)</td>
<td>-1.31 (-1.38/-1.24)</td>
<td>-0.15 (-0.14/-0.16)</td>
</tr>
<tr>
<td>6</td>
<td>6.75 (7.02/6.44)</td>
<td>63.7 (64.5/62.7)</td>
<td>-1.09 (-1.13/-1.05)</td>
<td>-1.32 (-1.38/-1.25)</td>
<td>-0.26 (-0.29/-0.23)</td>
</tr>
<tr>
<td>12</td>
<td>8.00 (8.30/7.66)</td>
<td>70.7 (71.6/69.9)</td>
<td>-1.37 (-1.40/-1.34)</td>
<td>-1.62 (-1.68/-1.55)</td>
<td>-0.75 (-0.76/-0.74)</td>
</tr>
<tr>
<td>24</td>
<td>9.74 (10.0/9.40)</td>
<td>80.5 (81.3/79.7)</td>
<td>-1.68 (-1.68/-1.68)</td>
<td>-2.02 (-2.04/-2.00)</td>
<td>-0.87 (-0.91/-0.84)</td>
</tr>
</tbody>
</table>

Violence against women increased the risk of low birth-weight (study I)
Low birth-weight (<2500 g) was found among 34% of infants of abused mothers and among 27% of infants of non-abused mothers. Mean birth-weight for infants of women exposed to any physical violence was 2670 g compared to 2730g for infants of never exposed mothers. Women’s exposure to any form of family violence, as well as the exposure to lifetime physical violence, emotional violence and high level of controlling behaviour in marriage were associated with lower birth-weight and shorter birth-length of the offspring (adjusted for possible confounders) (P<0.05).
Other risk factors for low birth-weight (study I)
Aside from different form of violence, the following characteristics were associated with low birth-weight:
- Low maternal educational level
- Multiparity/high birth order of child
- Older maternal age
- Poverty
- Religion (Hindi)
- Low maternal weight
- Short gestational age (prematurity).

Violence against women impaired child growth at 1-24 months of age (study I)
At 24 months, the proportion of underweight was 41.9%, wasted 13.3% and stunted 55.5% among children of mothers exposed to any form of family violence, compared to 37.0% underweight, 11.3% wasted and 49.8% stunted among children of non-abused mothers. Maternal exposure to any lifetime violence and to all different forms of violence independently increased the risk for impaired child growth during all assessments (every month for the first year of life and then every third month) until the child completed 24 months of age (adjusted for possible confounders).

Other risk factors for impaired child growth (study I)
Aside from the different form of violence, the following characteristics were associated with impaired growth between 1-24 months of age:
- Low maternal educational level
- Multiparity/high birth order of child
- Older maternal age
- Poverty
- Low birth-weight
- Low maternal weight

Infant morbidity
The mean episodes of diarrhoea were 3.9, of any respiratory tract infection 10.7 and of lower respiratory tract infections 2.2 per person year. Diarrhoeal disease was more common during the second half of infancy, and boys had a higher incidence of respiratory infections, but not of diarrhoeal disease, than girls.
Violence against women increased the risk of infant morbidity (study II)
Infants of mothers exposed to different forms of family violence had 25-31% higher incidence of diarrhoea and 16-83% higher incidence of ARI per person per year than other children did. Any lifetime family violence and all different forms of family violence independently were associated with increased rate ratios for incidence of diarrhoeal diseases and lower respiratory tract infections (adjusted for possible confounders).

Other risk factors for infant morbidity (study II)
Aside from the different form of violence, the following characteristics were associated with increased risk of infant morbidity (diarrhoeal diseases and respiratory tract infections):
- Low maternal educational level
- Multiparity/high birth order of child
- Older maternal age
- Poverty
- Religion (Muslim)
- Low maternal weight (ARI, not diarrhoea).

Maternal nutritional status in relation to child growth and morbidity (studies I and II)
In the main MINIMat intervention study, maternal weight was followed during pregnancy and until 2 years after delivery. When preparing Papers I and II, maternal weight at 12 months of child age was used as a marker for maternal nutritional status. Maternal weight at 12 months of child age was a mean of 45.3 kg (median 44.3kg), SD 7.10 and a range 28.6-95.9 kg.

Maternal weight was associated with birth-weight and children’s weight and length at 1-24 months of age; Mean weight of mothers of children with normal birth-weight (≥ 2500g) was 46.4 kg as compared to a mean weight of 42.8 kg for mothers of low birth-weight infants (unadjusted). Mean weight of mothers of non-stunted children was 47.1 kg and the mean weight of mothers of stunted children of 24 months of age was 43.5 kg (unadjusted). In addition, low maternal weight was associated with increased risk for infants falling ill with any acute respiratory tract infection and pneumonia, (unadjusted P<0.05), but not with diarrhoeal diseases.

All different forms of violence against women were significantly associated with lower maternal weight (P< 0.000). The strength of the associations between different forms of violence against women and low birth-weight of their offspring was reduced if maternal weight was included (adjusting for) in the statistical model, even though the significance remained for any violence and emotional violence (P< 0.05).
Under-five mortality

Table 5. Causes of and symptoms before death among the children dying before the age of five in the two studies including mortality

<table>
<thead>
<tr>
<th></th>
<th>Study III (n=110)</th>
<th>Study IV (n=237)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diarrhoea</td>
<td>25%</td>
<td>11%</td>
</tr>
<tr>
<td>Prematurity/low birth-weight</td>
<td>23%</td>
<td>16%</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>12%</td>
<td>19%</td>
</tr>
<tr>
<td>Other infections</td>
<td>14%</td>
<td>14%</td>
</tr>
<tr>
<td>Asphyxia</td>
<td>8%</td>
<td>4%</td>
</tr>
<tr>
<td>Other</td>
<td>18%</td>
<td>36%</td>
</tr>
</tbody>
</table>

In study III, under five mortality rate was not assessed due to the study design, but the level was around 60 per thousand live births; thus, approximately 1800 live births resulted in 110 under five deaths. In study IV, the overall under five-mortality was found to be 88 per thousand live births. A majority of the under-five deaths in both studies occurred during first year of life (infant mortality): 84% in study III and 73% in study IV. Furthermore, around half of all deaths occurred during the first 28 days of life i.e. neonatal deaths (53% in study III and 44% in study IV). In study III, 4% of under-five deaths was reported as caused by accidental trauma, in study IV, the corresponding number was 9% (mostly from drowning.

Neonatal deaths were mainly caused by prematurity/low birth-weight, asphyxia and other delivery complications, and after the neonatal period different infections were the most important cause of death. Malnutrition was frequently reported in both studies and considered as a contributing factor, mainly by increasing the incidence of and severity of infectious diseases.

Violence against women increased the risk of under-five mortality (studies III, IV)

In study III, the risk of death in infancy or before 5 years of age was more then six times greater if the mother had been exposed to both physical and sexual violence by a partner (adjusted for possible confounders). Physical or sexual partner violence against women was associated with a doubled risk.
for under-five mortality among her offspring. The form and severity of violence were more relevant to the risk of child death than the timing of the abuse or the relationship between the mother and the perpetrator. As this study was matched for sex and age of child, no conclusions could be drawn concerning gender or age group inequality on mortality, in relation to the mothers’ violence exposure.

Assessing all under-five deaths in study IV, there was no association between different forms of violence against women and under-five mortality. However, the sub-group of better-educated women had increased risks of under-five deaths of their female offspring if exposed to severe physical violence or to a high level of controlling behaviour in marriage (adjusted for possible confounders). Hence, under-five mortality rates for daughters of more educated mothers with high level of controlling behaviour in marriage was 130 per 1000 live births, in comparison with 58 per 1000 live births among daughters of better educated mothers with low level of controlling behaviour. Under-five mortality rates for daughters of less educated mothers did not vary with violence exposure. Mortality rates for boys did not vary with violence exposure at any educational level of the mother.

Other risk factors for under-five mortality (study III, IV)
Aside from the different form of violence, the following characteristics were associated with increased mortality risks for children under the age of five:

- Low maternal educational level (studies III and IV)
- Multiparity/high birth order of child (study III)
- Older maternal age (study III)
- Poverty (study IV)
- Rural area of residence (only relevant in study III)
- Birth in early time-period (only relevant in study IV)
- Religion (only relevant in study IV).
<table>
<thead>
<tr>
<th>Paper</th>
<th>Problem Addressed</th>
<th>Main results in relation to women’s violence exposure (adjusted for confounders)</th>
</tr>
</thead>
</table>
| I     | Family violence in relation to growth from birth- 24 months of age               | Differences in birth-weight Z-scores (WAZ)  
Any violence/no violence: 1.44/1.30  (P=0.000)  
Differences in HAZ at 24 months  
Any violence/no violence: 2.11/1.88  (P=0.000)  
Differences in WAZ at 24 months  
Any violence/no violence: 1.77/1.54  (P=0.000)                                                                                                                                 |
| II    | Family violence in relation to incidence of morbidity: diarrhoea and ARI from 1-12 months of age | Rate ratios for incidence of diarrhoeal disease  
Any violence: 1.20 (CI=1.10-1.30)  
Severe violence: 1.28 (CI=1.10-1.48)  
Rate ratio for incidence of pneumonia  
Any violence: 1.31 (CI=1.17-1.46)  
Severe violence: 1.51 (CI=1.26-1.80)  
Severe violence 1-6 months of age: 1.76 (CI=1.37-2.26)                                                                                                                                 |
| III   | Family violence in relation to infant and under-five mortality                   | Odds ratio for < 5 mortality  
Physical and sexual violence: 6.3 (CI=2.3–17.1)  
Physical or sexual violence: 2.1 (CI=1.1–4.1)                                                                                                                                 |
| IV    | Partner violence in relation to under-five mortality, including gender differences | Hazard ratio for <5 mortality among daughters of educated mothers:  
Severe violence: 2.2 (CI=1.06-4.50)  
High level of control: 2.5 (CI=1.30-4.90)                                                                                                                                 |
Discussion

General discussion

This thesis revealed that violence against women severely impairs infant and child health in two low-income communities with different cultural and ethnic characteristics; Bangladesh and Nicaragua. Specifically, the investigation disclosed that women’s exposure to family or partner violence was associated with i) lower body size at birth, ii) impaired early childhood growth, iii) increased infant morbidity and iii) increased under-five mortality.

The finding of an increased risk of lower body size of newborns of abused women (study I) was in accordance with previous reports of an association between physical and sexual partner violence and low birth-weight of the offspring. The design of the present investigation (study I) amplified the validity of findings from previous studies and added information on the association between maternal violence exposure and shorter birth length.

An important new finding was the increased risk for growth impairment also after the foetal period (study I) which implied a continued increased risk of chronic under-nutrition among children of abused mothers. To the author’s knowledge, this is the first longitudinal follow-up of children’s growth in relation to maternal violence exposure, and the only study assessing different forms of violence in relation to child growth. However, the finding was in accordance with one recently presented large cross-sectional study from India where physical violence against women is associated with increased risk of stunting and wasting among children younger than 3 years of age.

Children of mothers exposed to different forms of family violence had an increased risk of falling ill with diarrhoeal diseases (study II), as previously indicated in a cross-sectional study in Uganda. In addition, another new finding (study II) was the significant increase in reported respiratory tract infections, especially pneumonia, among infants of abused mothers. These findings are especially relevant in low-income settings where diarrhoeal disease and pneumonia, in combination with chronic under-nutrition, are the main causes of infant and under-five deaths.
The increased risk of under-nutrition and the higher incidence of infectious diseases may explain the findings of fatal consequences for children of abused mothers (studies III, IV). In Nicaragua the risk of under-five mortality among children of physically and sexually abused mothers was two to six times higher than for children of non-abused mothers. An increased under-five mortality risk associated to women’s violence exposure was also found in Bangladesh, although only in the sub-group, daughters of better-educated women. Causes of death were assessed in study III and IV, but the number of deaths was too small to evaluate cause-specific under-five mortality in relation to maternal violence exposure. The interpretation drawn out of these data is that violence against women contributes to under-five mortality in both settings, but because of other factors protecting from or contributing to child death, the consequences of violence varies among sub-populations. The present findings confirmed, however, reports from two studies from India on a positive association between physical abuse and neonatal \(^82\) and infant mortality.\(^83\)

Gender differences in mortality related to women’s violence exposure has not been previously studied. However, in several South Asian countries, overall excess female under-five mortality is well described.\(^154,156,157\) The present finding of an increased risk of female under-five mortality related to mother’s violence exposure in Bangladesh (study IV), may be explained by that male children are able to elicit more care from the mother and/or from other family members, than female children do. Therefore, the boys might have been protected from excessive mortality. In the Nicaraguan study (study III) referents were matched to cases in gender, thus, the possibility to discuss gender differences in mortality among different groups was eliminated in the study design. On the other hand, the Nicaraguan society is not recognized for excess female child mortality.

Moreover, the results from study IV indicated that educated women who experienced severe physical violence or high level of controlling behaviour in marriage lost the beneficial effect of education on female child survival, thus placing their daughters at the same mortality risk level as for non-educated mothers. These findings is in accordance with the literature describing that higher socio-economic status and better education among women has not reduced discrimination against girls in South Asia.\(^163,165\)

Another important finding in the present investigation (studies I, II, IV) was that any form of family violence, also emotional violence and controlling behaviour in marriage without any physical or sexual assault, were independent risk factors for impaired child health. Previous studies have mainly assessed physical and sexual violence in relation to child related outcomes.\(^78,79,81-83\) The very fear of violence is described to be at least as dan-
gerous for women’s mental health as the physical violence per se and may increase the risk of severe depression. Furthermore, a high level of controlling behaviour reduces the woman’s autonomy and may interfere with her possibility to take adequate decisions concerning everyday childcare matters, leading to negative health consequences for her children.

In addition, a dose response relation between violence exposure and the outcomes measured was found. A combination of different forms of violence, severe physical violence and exposure to a higher level of controlling behaviours appeared related to more profound consequences on the outcomes measured, than any physical violence or lower level of control. Moreover, in all four studies the timing of the abuse gave the impression to be of less relevance for the impact on child health than the exposure to violence per se, as current violence had no stronger impact than lifetime violence. The present findings underscore the extent to which the traumatic effects of violence may persist even if the violence itself has ended. This is congruent with previous studies, describing the long-term consequences of violence being devastating for women’s health, an alternative explanation is that cumulative abuse strongly affects health.

One dilemma when trying to explain how violence against women can lead to severe health consequences for their offspring is that the effect might be indirect and via different intermediaries that function along a causal pathway (Figure 2). A number of potential intermediate factors could be considered as cascading forces rather than confounders between violence and health outcomes. Violence against pregnant women may through several pathways impair foetal status, for example i) cause foetal injury and preterm delivery by direct abdominal trauma ii) exert physiological changes in the intrauterine environment by means of maternal stress and depression, leading to foetal growth retardation and increased risk of pregnancy related infections and iii) affect the pregnant women’s health care seeking and overall behaviour in a negative way (see background for more details).
During early childhood mother’s violence exposure may interfere with their care giving behaviours through several pathways such as i) physical health impairment\textsuperscript{3,232} reduces women’s possibility for childcare, ii) mental health impairment such as stress and depression\textsuperscript{3,4} might lead to disturbances in the emotional interaction between mother and child\textsuperscript{166,184} and to diminished quality of different care giving behaviours,\textsuperscript{166,179,239} which increases children’s risk of growth failure and of falling ill in from example diarrhoeal diseases,\textsuperscript{195,196} iii) diminished autonomy,\textsuperscript{1,8,240} social isolation,\textsuperscript{8,69} lack of control over financial resources\textsuperscript{69,240,244} all of which may lead to impaired quality of everyday childcare behaviours and to insufficient health care seeking (see background for more details).

Unhealthy maternal behaviour among abused women, such as smoking and excess alcohol use, are additional possible explanations for how violence exposure could interfere with foetal growth. However, this is unlikely to play an import role in the present study settings, since the use of nicotine and alcohol is rare among the female populations studied. Only 3% of the Nicaraguan mothers in study III reported smoking during pregnancy and smoking is even more uncommon among rural Bangladeshi women. In addition, it
cannot be excluded that some of the negative impact on child health determined in these studies was directly related to child maltreatment, as the co-occurrence of violence against women and children in the same household is high. \textsuperscript{71,73} however, child abuse was not specifically addressed in our studies.

In low-income settings child health and survival is strongly jeopardised by a cluster of interrelated coexistent factors, which together constitute the “poverty syndrome”. \textsuperscript{92,128,261} These factors include high female illiteracy, low income, food insecurity, household overcrowding, lack of clean water and good sanitation, and poor access to health care. \textsuperscript{107,263} The results of this thesis suggested that family violence against women ought to be included as an important contributing factor in this “poverty syndrome”.

There is evidence suggesting that good psychosocial care is associated with favourable nutritional status and growth outcomes among infants within poor population with nutritional health risks. \textsuperscript{185,264} Ruel et al (1999) present data from a community survey in Ghana, where good feeding practices and the use of preventive health services were strong determinants of children’s height for age and good care giving behaviour compensated for some of the negative effects of poverty and low maternal education. \textsuperscript{265} Hence, good childcare might be even more decisive for child health in low-income settings, where conditions of life are especially hostile.

The inferences that might be drawn from this thesis was that good maternal health, e.g. without violence exposure, is crucial for the health of the newborn and the welfare of small children. This might also be valid in a middle- and high-income setting as violence against women is widespread all over the world, although different socio-economical and environmental characteristics may modify the influence.

Methodological considerations

External validity

The findings from the four studies included in this thesis might be relevant for other areas in Bangladesh and Nicaragua, and for neighbouring low-income countries. The consequences of violence against women on infants’ health exist and are probably relevant in other countries with similar patterns of violence exposure and high level of under-five mortality. Moreover, children of women living under different conditions of life, e.g. economic and social situations, might be affected differently, but the findings are of general interest as violence against women is widespread and causes health consequences for victimised women.\textsuperscript{4}
All four studies were population-based, and efforts ensured that the samples were representative for the populations studied. The study areas manifested the typical characteristics of rural Bangladesh and urban/rural Nicaragua. However, the settings have a research infrastructure that might have interfered with some behaviour among the women, although it is unlikely this had any influence on the results.

The findings in general, were consistent between the culturally and ethnically different study populations in Bangladesh and Nicaragua and thus increased external validity. Whereas, an overall increase in under-five mortality in relation to maternal violence history was determined in the Nicaraguan study (study III), the increase in under-five mortality was only found among daughters of educated mothers in Bangladesh (study IV). The interpretation drawn from studies III and IV is that violence against women contributes to under-five mortality in both settings, but because of other factors, protecting from or contributing to child death, the consequences of violence varies among sub-populations.

Internal validity and reliability
To ensure validity and reliability of the data collected, fieldworkers underwent careful training in different aspects of interview techniques and data collection. Moreover, existing validated instruments were used with minor modifications to adapt questions to the cultural context. All questionnaires were pre-tested in pilot studies in the study areas.

Selection bias
In order to provide a random sample representative for the population, all pregnant women within the study area were invited to participate in study I and II, and a multistage sampling schema was used in study IV. Furthermore, in study III, an effort was made to identify all under-five deaths within the study population and the referents were randomly selected from the whole study population, which covered 25% of the area.

Refusal rate was low (<2.5%) in all four studies, i.e. almost all women located accepted to participate. Migration out of the study area, was the main reason for loss on follow-up of study participants. Migrating women may differ in basic characteristics such as age, educational level, and poverty level and therefore they could also represent a population with different exposure to family violence. However, in all four studies, the proportion lost on follow-up was rather small (<12%) and it appears unlikely that this potential selection bias would have influenced the outcomes. Maternal death was rare events during the on-going studies and therefore could not bias the results.
Information bias

Under reporting of violence

Under reporting of violence is common among abused women, whereas over reporting or fabricating acts of violence are rare in violence research. Under-reporting might be related to stigma, self-blame, loyalty to the offender and fear of reprisal attached to victimisation. To decrease under reporting the following strategies were used in the four studies: In-person interviews rather than self-administered questionnaire were used, the questions were behaviourally specific, women were given several opportunities to reveal within the same interview and efforts to create an atmosphere of confidence were taken. Repeated interviews increase true reporting of violence exposure; however, as this methods was not used, it cannot be excluded that an underreporting occurred.

Design of the study protocol has been reported to influence the reporting of violence exposure among women. Thus, studies not focusing primarily on violence exposure run a risk of under reporting. In the present investigation, the study protocol of the main MINIMat study (of which studies I and II were part), included several different study items and other time-consuming study procedures, such as ultrasound examinations and blood samplings, whereas the protocol for study IV mainly focused on violence exposure. Therefore, an underreporting of violence experience in study I and II might explain the lower proportions of violence exposure among women in these studies, compared to study IV although representing very similar populations. If under reporting of violence exposure is the case in studies I-II, then a dilution of the association between violence and the outcomes, child growth and morbidity occurred. This would then indicate that the negative impact on child health outcomes is stronger than presented in Papers I and II.

Reporting of disease-related symptoms

In study III the symptoms prior to infant deaths were easily remembered by mothers. Even a long time (up to a maximum 5 years) after the event, mothers could remember details about the days preceding the death of their child. This finding was in agreement with a previous report suggesting that the perceived importance of an event influence the reliability of recalls, self reported by mothers. However, certain symptoms may have been more easily perceived and described by mothers such as diarrhoea and accidents, whereas other symptom such as different febrile conditions, which could be caused by pneumonia and other infections, are more difficult to classify out of the mothers own stories. Therefore, symptom specific mortality can be imprecise.
When assessing morbidity symptoms (study II), a short recall period (7 days) was used. Short recall periods increase the quality of self-reported data. In current literature on child morbidity, the definition of diarrhoeal diseases and respiratory tract infections is inconsistent. Further, most studies rely on mothers or primary caregivers recall, rather than direct observation of the researcher. This might weaken the validity of acquired data and reduce the possibility to compare data from different studies.

In the present investigation on child morbidity (study II) the recall on morbidity symptoms included a number of fixed alternatives of common symptoms and additional open questions. The definition of diarrhoea was simple and relied on the mothers own perceptions about what is abnormally loose stools, which has been found to be of good specificity. Fast breathing and fever, which are the symptoms interpreted as pneumonia in this study, are considered to provide the highest positive predictive value for pneumonia in self-reporting. Dates at onset and ending of morbidity symptoms were not reported but only the presence or absence of symptoms for each of the preceding seven-days, meaning that the exact duration of an illness could not be estimated. Hence, the burden of persistent diarrhoea (symptoms lasting > 14 days), which contributes to a considerable proportion of the serious cases of diarrhoea could not be assessed.

In addition, the seasonal variation in births and in infant morbidity did not influence the results as all live births during a two-year period were included and the children were followed until 12 months of age.

Confounding bias
In all four studies, confounders in the statistical analysis were accounted for by multivariate modelling. In study I maternal under-nutrition was considered as an intermediate between violence exposure and retarded foetal and child growth and maternal weight was therefore not considered as a confounder. Stratifying for women’s nutritional status indicated that also among better-nourished women (> 45 kg) associations between the forms of violence and lower WAZ and HAZ at 24 months were present, and the effect estimations were almost the same as for the whole study population. However, even if maternal weight was considering as a confounder, the main finding would persist, although in some analysis with reduced effect estimator.

The confounders adjusted for in the present investigation were those factors that most commonly found to be interrelated with child growth, health and survival in the settings studied. However, other factors of importance might include: information on husbands/fathers (presence or absence in daily household life, educational level, income etc), other authorities in
the household (parents-in-law, brothers-in-laws etc), the level of crowding in household (birth order might be a marker, but is not sufficient to describe a pattern of extended family etc), children’s birth order in relation to gender of siblings (important when assessing gender inequalities), and apart from the duration of exclusive breastfeeding, details on complementary food and weaning practices.

Moreover, the socio-economic indicators used in the present investigation might not reflect all the relevant factors associated with the situation of poverty. In study I, there was no association between basic needs assessment level (poverty) and infant or under-5 mortality, although there was an association between rural mothers and those with low educational attainment and mortality among their offspring. This indicated that the instrument used to estimate unsatisfied basic needs was not sensitive enough to pick up poverty differences in that study.

Another limitation of this thesis may be that causality between violence against women and child deaths in studies III and IV could not be established because of limited information on the timing of violence experience in relation to child death. However, data from study IV revealed that violence was usually initiated early in a relationship, this in accordance with other studies in the field. Moreover, although it was assumed that one of the most important pathways between violence against women and negative impact on child health was mediated through care giving behaviour, there is no data (apart from some data on exclusive breastfeeding) on childcare available in this thesis. In addition, there is no information on home treatment such as ORT and utilisation of health services, which is a limitation when trying to understand the relationship between violence against mothers and infant morbidity.
Summary and conclusions

The present thesis investigated the impact of physical, sexual and emotional violence against women of reproductive age and the level of controlling behaviour in marriage on child health and survival in two different cultural settings. Data were acquired from four quantitative community-based studies; two cohort studies performed in rural Bangladesh and one case-referent study in urban/rural Nicaragua.

- Maternal exposure to any form of violence, and to physical, sexual and emotional violence and a high level of controlling behaviour, independently, were associated with i) lower body size at birth, ii) an increased risk of stunting and under-weight at 24 months of age, iii) slower growth velocity during the first two years of life and iii) a higher incidence of diarrheal episodes and respiratory tract infections.

- In the Nicaraguan setting, children of women who experienced any history of physical violence had a two fold increase in risk of death before the age of 5 years and those whose mothers experienced both physical and sexual violence had a six fold increase in risk of death before the age of 5 years.

- In the Bangladesh setting, an association between violence against women and under-five mortality was found among daughters of educated mothers who were exposed to severe physical violence or to a high level of controlling behaviour in marriage.

- In both settings, lifetime violence experience among participating women was high (37-69%) and the timing of the violent acts was less relevant for the outcomes studied, than the exposure to violence per se.

- Any form of violence, not only physical and sexual, but also emotional violence and controlling behaviour in marriage were independent risk factors for impaired child health.

- A dose response relation between women’s violence exposure and impaired child health was found. A combination of different forms of violence, severe physical violence and exposure to a higher level of control-
ling behaviours seemed to be related to more profound consequences on outcomes.

**Conclusions**
- The findings revealed that violence against women severely impairs infant and child health and survival in two different cultural settings; Bangladesh and Nicaragua.

- The implication of the results is that violence against women’s not only impair foetal growth, but also causes a continued increased risk of negative health consequences after birth among children of abused women.

- The findings are of major public health importance demonstrating that violence against women not only causes devastating consequences for women’s health, but also for children’s health and survival. In interventions aimed at improving child health and survival, efforts are needed to protecting women from all forms of violence.

- Given the overall high prevalence of violence against women, the findings from this thesis may be relevant in other settings and also of interest for clinicians when assessing children with different problems related to nutritional status and morbidity.

**Further research**

Addressing the whole issue of the impact of violence against women on child health in low-income countries is far beyond the scope of this thesis. Nevertheless, a number of research questions, which may be addressed in future research, arose:

- There is a need for better understanding of the causal structures between violence against women and impaired growth and increased morbidity of their offspring. Although stress-related physiological processes in pregnant women are rather well described, the influences of violence on maternal care giving behaviour need to be much better understood.

- Interventional approaches aimed at reducing violence against women are urgently needed at public health and health care service level. As violence against women is a rather hidden problem for the health sector, identifying women living with violence is a challenge for health care providers. Research on promoting disclosure and dealing with the effects of disclosure are needed in both low-income and high-income settings.
• The mother’s well-being is a key issue for effective child health promotion programmes (in low-income countries) focusing on: infant feeding, sanitation, immunisation, health education and health seeking behaviour. Therefore, the mothers’ well-being needs to be included and evaluated in these programmes.

• Gender differences in child health outcomes in relation to maternal violence exposure needs further understanding. If there are gender differences, what are the mechanisms of discrimination and how are they prevented.

• The father’s role in care giving in low-income countries is rarely included in discussions on care giving. Strategies for increasing father’s commitment are needed.
Våld mot kvinnor påverkar barns tillväxt, sjuklighet och överlevnad. Studier från Bangladesh och Nicaragua.

Bakgrund
Våld mot kvinnor är utbrett över hela världen och har långtgående negativa konsekvenser för kvinnors såväl mentala som fysiska hälsa. Vidare leder våldet ofta till inskränkt autonomi och social isolering för drabbade kvinnor. Våld mot kvinnor inkluderar flera olika former av övergrepp: fysiskt, sexuellt och emotionellt våld samt utbredd kontroll över kvinnan i en relation. En nyligen utförd multinationell studie visar Världshälsoorganisationen (WHO) på att 13-61% av kvinnor i åldrarna 15-49 år någon gång har blivit fysiskt misshandlade. En manlig partner (tidigare eller nuvarande) står för över 75% av övergreppen mot kvinnor.

Fler än hälften av alla kvinnor som är utsatta för våld är vårdnadshavare för små barn. Tidigare studier från höginkomstländer har visat på en ökad risk för mentala problem och försenad psykomotorisk utveckling hos barn till misshandlade kvinnor. Kunskap om fysiska hälsoeffekter hos barn till följd av våld mot kvinnor är begränsad.

Avhandlingens syfte
Det övergripande syftet med avhandlingen var att undersöka hur olika former av våld mot kvinnor – fysiskt, sexuellt och emotionellt våld samt kontroll över kvinnan – påverkar små barns tillväxt, sjuklighet och överlevnad i två låginkomstländer, Bangladesh och Nicaragua.

Metod och resultat
Avhandlingen bygger på 4 befolkningsbaserade epidemiologiska studier. Deltagande kvinnor intervjuades av speciellt utbildade kvinnliga medarbetare och stor omsorg lades på etiska aspekter vid intervjuerna. Kvinnornas exponering för olika former av våld inom familjen, från 15 års ålder till tidpunkten för intervjun, utvärderades i relation till barnens födelsevikt och födelselängd, barnens tillväxt de första två levnadsåren, barnens sjuklighet i
diarréer och luftvägsinfektioner det första levnadsåret och barnens risk att dö före fem års ålder.

Två av studierna innefattade en uppföljning av 3164 Bangladeshiska mor-barn par från barnens födelse till 2 års ålder. Barnen till kvinnor som utsatts för någon form av våld var mindre till storlek vid födelsen, var kortare och vägde mindre vid 2 års ålder och hade en långsammare tillväxthastighet från 0 till 2 års ålder, jämfört med barnen till kvinnor som ej utsatts för våld. Barn till kvinnor som utsatts för olika former av våld hade, 25-31% fler episoder med diarré och 16-83% fler luftvägsinfektioner under första levnadsåret i jämförelse med barnen till kvinnor som inte utsatts för våld.

En tredje studie, i Nicaragua, undersökte 110 mödrar till barn som avlidit före 5 års ålder och 203 mödrar till levande barn som kontroller. Barnen till kvinnor som utsatts för fysiskt våld hade dubbelt så hög risk att dö före 5 års ålder och de vars mödrar utsatts för både fysiskt och sexuellt våld hade 6 gånger högre risk att dö före 5 års ålder jämfört med barnen till kvinnor som ej utsatts för våld.

Den fjärde studien var en uppföljning av 1048 Bangladeshiska kvinnor och deras 2691 barn upp till 5 års ålder. I den barngruppen fanns en ökad dödlighet inom gruppen av döttrar till utbildade kvinnor relaterat till mödrarnas våldsexponering.

I alla fyra studierna var våld mot kvinnor utbrett, 37-69% av alla kvinnor som intervjuades hade någon gång efter 15 års ålder blivit utsatta för våld inom familjen. Olika former av övergrepp också emotionellt våld och utbredd kontroll över kvinnan, förutom fysiskt eller sexuellt våld, var relaterat till negativa hälsokonsekvenser för barnen. Övergreppen i sig var av större betydelse för påverkan på barnens hälsa än tidpunkten när de utfördes.

**Diskussion och slutsats**

Resultaten från avhandlingen visar att våld mot kvinnor var relaterat till i) mindre storlek på det nyfödda barnet, ii) försämrad tillväxt under de två första levnadsåren, iii) ökat insjuknande i diarré sjukdom och lunginflammation det första levnadsåret, samt iii) en ökad barnadödlighet under de första fem levnadsåren.

Våld mot kvinnor kan påverka barns hälsa via flera olika direkta och indirekta mekanismer och kombinationer av dessa. Direkt fysiskt våld mot gravida kvinnor kan ge skador på de ofödda barnen och leda till för tidig förlossning.21 Mental påverkan på kvinnan i form av stress och depression relaterat till våldet kan ge fysiologiska förändringar med bl.a. ökade nivåer av stresshormoner som påverkar fosterets tillväxt.102 Vidare kan olika former av men-
tal påverkan på mödrarna, såsom stress och depression, leda till omsorgssvikt som i sin tur ökar risken för undernäring och ökad sjuklighet hos barnen.\textsuperscript{179,233} Våld mot kvinnor inom familjen begränsar ofta kvinnans tillgång till ekonomiska resurser och möjligheter att ta och verkställa egna beslut, vilka kan vara avgörande för barnens hälsa, t.ex. när det gäller att söka sjukvård.\textsuperscript{240}

Avhandlingens resultat är speciellt relevanta i områden med uttalad fattigdom och hög barnadödlighet till följd av undernäring och infektionssjukdomar, såsom i Bangladesh och Nicaragua. Fynden kan dock vara av intresse även i helt andra miljöer eftersom våld mot kvinnor är utbrett världen över. En global strävan mot förbättrad barnhälsa måste prioritera åtgärder för att begränsa våld mot kvinnor.
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