

Policy Implications of Present Knowledge on the Development and Prevention of Physical Aggression

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Abstract Research indicates that children are born with aggressive tendencies which they learn to control through early socialization. A small group, however, shows high aggression levels early on which remain stable throughout their life. Physical aggression is an epiphenomenon in a wide variety of antisocial behaviour, which wrecks the life of the individual as well as having large and negative consequences on society. The premise of this article is that physical aggression can be successfully influenced, but that there is a small window of opportunity in which to do this. Five rules about interventions which are more likely to be successful are presented: 1) the need for adequate evaluation, 2) the increased benefits of early prevention rather than later intervention, 3) intervention in multiple domains of the child's life, 4) the importance of paying attention to treatment

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fidelity and professional execution, and 5) The current lack of substantive guidelines for specific interventions types. Within this context we review seven types of interventions to prevent physical aggression including: (1) promotion of physical health of mother and child, (2) increase family income, (3) increase access to existing services, (4) home visiting, (5) childcare, (6) preschool programs and (7) improving parenting. We conclude that promoting the physical health of mother and child should be more actively pursued, though additional experimental evidence is needed to clarify the relationship between health and social behaviour. An increase in family income, however, was not found by itself to help prevent the occurrence of physical aggression. An increase in access to existing services does not seem to reduce physical aggression, possibly because of the variable quality of these services. There is strong evidence that nurse home visitation programs, like the Nurse-Family Partnership, as well as some of the more rigorous preschool programs like the High/Scope Perry Preschool program, can be effective in deterring a child's trajectory into violence, though more research in both these areas is needed and this research should be done by those who are not connected to these programs or past evaluations. Finally, we find that improving parenting through programmes like the Parent-Child Interaction Therapy programme can reduce the likelihood of violent behaviour, though, again, more experimental evidence is necessary. Overall, we argue that more experimental studies are necessary to better guide policy.

Keywords Physical violence · Externalizing behaviours · Antisocial behaviour · Prevention · Policy · Crime

An extensive review of the literature indicates that the best way to limit aggressive behaviour is to work on preventing it before the pattern is established in the child. In other words, policies should support programs that look to prevent rather than waiting to intervene. Research further indicates that the best time to effectively intervene is early in the child's life – as early as during the mother's pregnancy and directly after birth. We, therefore, investigate preventive programs that have been implemented to determine which ones could be recommended as best practices. We use experimental evidence to evaluate the effectiveness of these programs. Those that are found to successfully reduce the likelihood of future aggression will be used as building blocks to formulate policies for the prevention of violence.

What Policy Makers Should Know About Violence

The main focus of this article is on the prevention of physical aggression or violence. Physical aggression is defined as attacks and injurious behaviour. For an extended discussion of the concept of aggression, readers are referred to Tremblay (Tremblay 2000). However, a few basics about physical aggression will help explain some of the findings that are presented below in the program intervention section.

Physical Aggression Over the Life Course

Physical aggression can be observed in young children. According to mothers' reports, physical aggression appears in the first years of life and starts decreasing gradually from the age of 3 years and on. Recent data show that almost all children display at least some

physically aggressive behaviour and that it peaks between the ages of two and four years of age. After the age of four, however, physical aggression quickly declines with most children learning by the time that they are five to eight years old to control their displays of anger (Nagin and Tremblay 1999; Tremblay et al. 1999). Unfortunately, some continue to behave in a physically aggressive manner at relatively high rates. Baillargeon, Tremblay, & Willms (Baillargeon et al. 1999) estimated that 70% of 2–4 year old Canadian children display low levels, approximately 26% display moderate levels, and the remaining 4% display very high levels of physical aggression.

Life-Long Stability of Physical Aggression

Aggressive behaviour not only appears at a young age, but once it appears it seems to be a constant behavioural pattern. In fact, aggressive behaviour has been found to be one of the most stable forms of behaviour (Olweus 1979; Verhulst and Van der Ende 1992; Zunkley 1994). A meta-analysis reported stability coefficients of .70 to .80 after one to five years and of .60 to .70 after six to fifteen years (Olweus 1979). Even in very young children, there is already considerable stability. Van Aken and her colleagues (Van Aken et al. 2007) found stability coefficients of .73 in toddlers between 17 and 23 months and .56 in children between 17 and 35 months of age. And studies show that the earlier children display antisocial behaviour, the more likely it is that they will continue to be antisocial in the future (Caspi and Silva 1995; Moffitt 1993).

Intergenerational Stability of Physical Aggression

Research indicates considerable intergenerational continuity in physical aggression. When parents have a history of violence and crime, the likelihood that the same will hold for their children is relatively high (Glueck and Glueck 1950; Robins 1966). Serbin and her colleagues (Serbin et al. 1998) found that aggressive behaviour and depressive symptoms in girls measured during primary school (when the children were between the ages 5 to 13 years of age) were predictive of aggressive as well as non-responsive behaviours in their children. This finding is remarkable in that there was approximately 20 years between the measurements of mothers and their children.

Negative Outcomes of Physical Aggression

As with other social ills, scientists are finding that aggression is not an isolated aspect in a person's life. On the contrary, it generally is found in individuals who lead a disorganised life and are confronted with a large variety of problems starting in their early years. Aggressive children have a higher likelihood of experiencing a wide variety of psychiatric problems including depression, addiction, and personality disorders with these and other problems continuing into their adult lives (Matthys 2003). Violence is also predictive of future substance abuse and smoking, including smoking during pregnancy (Elliott 1993; Junger and Dekovic 2003), as well as physical health problems (Bardone et al. 1998; Laub and Vaillant 2000). Furthermore, there is a relatively strong relationship between aggression, externalising behaviour and crime, on the one hand, and unintentional injuries, such as traffic accidents and falls, on the other hand (Farrington 1995). Violent individuals have also been found to have relatively high rates of victimization (Shepherd and Farrington 1995) leading, not surprisingly, to higher mortality rates (Laub and Vaillant 2000). Aggression is also correlated with comparatively low levels of cognitive functioning

(Huesmann et al. 1987) and a lower likelihood of graduating from school and subsequently higher likelihood of being unemployed (Kokko and Pulkkinen 2000; Robins 1966).

Some Basic Rules About Interventions

Regarding interventions, five rules were identified in our extensive review of the research literature on aggression in children: 1) the importance of adequate evaluation, 2) early interventions generate more benefits than later interventions, 3) intervene in multiple domains; 4) the need for attention to treatment fidelity and 5) the absence of substantive guidelines for evaluating the content of specific prevention programs. Below we speak more extensively about each of these.

Rule 1 The importance of adequate evaluation

Many authors emphasize the importance of randomised controlled trials (RCTs) as the best way to test an intervention (Biglan et al. 2003; Leeuw 2005). As Farrington noted, "Randomization ensures that people assigned to one condition are equivalent in every possible way to those assigned to another condition.... It is then possible to disentangle the effects of the treatments from the effects of extraneous variables (uncontrolled differences between the groups)..." (Farrington 1983, p. 259). Though experimental research has been widely held as the gold standard in medical research (Chalmers 2003) this design actually has a long and illustrious history in sociological, psychological and educational research starting in the 1800s (Oakley 2000). Recently, the experimental design has experienced a resurgence in popularity in many of the social sciences as top researchers throughout the nation in fields as disparate as education (Boruch Dennis and Carter-Greer 1988), criminology (Weisburd et al. 1993), health (Devine et al. 1994) and sociology (Berk et al. 1985) have begun to convincingly argue for the need to more definitively answer policy questions through the use of experimental research (Berk et al. 1985; Feder and Boruch 2000; Sherman 2001). Of course, concluding that an intervention works and can be applied in the community requires more than one RCT. Towards these ends, replication is also recommended. Specifically, several trials, including one within the community, should be conducted. And past experience indicates the importance of independent evaluations, so that someone not associated with the original program design, development, implementation and/or evaluation be involved in one of these replications to ensure a fair test of its effectiveness.

Experimental studies are necessary to more definitively determine what works and what does not. Recently, researchers have found that many interventions, despite having been implemented with the best of intentions, have no effects and other programs have even been found to be harmful (Dishion et al. 1999; Riecken and Boruch 1978). One recent example is provided by the drug-prevention program 'DARE', which is still being offered to children in American schools where over 15,000 law enforcement officers are actively delivering the program (Cunningham and Baker 2003). Its goal is to provide information about drugs, to teach children refusal skills and, additionally, to increase their self-esteem. Despite its widespread acceptance, several studies have found that children given the DARE program are no less likely to use drugs (Gottfredson 1998; Lynam et al. 1999).

Some programs have even been found to be harmful. The 'Scared Straight' program brings at-risk and delinquent youth into prisons where long-term inmates intentionally try to intimidate them. The goal is to deter future delinquent behaviour in these adolescents by exposing them to the frightening nature of imprisonment. A television documentary described the program and claimed that it was very effective, citing success rates of 80 to

90% (Petrosino et al. 2002). Perhaps in part because of the massive media coverage Scared Straight received, the program has now been implemented in Norway, the United Kingdom and Canada. However, no single rigorous study has been able to support the documentary's assertion of program effectiveness. And a recent meta-analysis found that not one of the nine randomised evaluations implemented had shown any positive effects for the program. On the contrary, the probability of recidivism among those participating in Scared Straight was 1.6 to 1.7 times higher than for delinquents who were not in the program (Petrosino et al. 2002). In other words, results indicated that Scared Straight increased the likelihood that children would get (re)involved in delinquent and criminal behaviour.

Taken together, DARE, Scared Straight and other programs which have subsequently been found to be ineffective or even harmful provide a clear demonstration that good intentions alone are not enough when making decisions about the value of a program. As Dishion and his colleagues noted, "The scientific and professional community must be open to the possibility that intentions to help may inadvertently lead to unintentional harm" (Dishion et al. 1999, p. 763). The literature also indicates another important lesson; rigor of the research design may affect findings regarding the effectiveness of the program. Specifically, a number of researchers have recently found evidence of a positive bias when non-randomized designs are used to evaluate programs (Shadish and Ragsdale 1996; Weisburd et al. 2001). Even rigorous quasi-experimental studies that use statistical controls or matching to establish group comparability seem not to be immune to this possibility. The research literature, therefore, establishes the need for experimentally designed studies that control for known as well as unknown extraneous variables, otherwise potentially harmful effects associated with a program may not be identified (Dishion et al. 1999) To the extent that there is a real possibility that even well-intended programs and policies may be harmful, we, along with others (Meeker and Binder 1990), argue that it is unethical to expose large numbers of individuals to inadequately tested interventions. Indeed, this position is becoming more widely accepted as can be seen by the fact that experimental design is becoming a central component of the movement toward evidence-based practice (Feder and Boruch 2000).

Rule 2 Look to prevent rather than to intervene

Given the difficulties in finding interventions that are successful in changing violent behavioural patterns once they have been established (Lipsey 1995), many researchers in this field are now focussing on preventive programs (Bernazzani et al. 2001; Sherman et al. 1997). 'The earlier the better' seems a wise guideline for policymakers. Four points strongly support this rule: 1) Recent research has emphasised the importance of the early years in the healthy development of children (Shonkoff and Meisels 2000). 2) As mentioned previously, aggression tends to be a stable behavioural tendency from a relatively early age. 3) Also as reported earlier, physical aggression is related to many other negative life outcomes and intervening early may help to avoid not just the aggression but some of the other associated negative outcomes. As will be discussed later, some early preventive intervention programs do indeed show that these efforts are successful at changing the child's aggressive behavioural trajectory as well as other associated problems, including those involving the child's health, education and economic achievement. 4) An economic analysis of experimental studies of interventions beginning at different ages concluded that the most effective way to allocate resources, given the expected outcomes, is to invest heavily in the first years of life and that interventions later in life produce increasingly less benefit (Carneiro and Heckman 2003).

This rule also seems to apply regarding prevention programs aimed at adults. A series of studies done by Olds (Olds et al. 1999) indicates that intensive home visitation conducted

by nurses which start during pregnancy and continue until the child is two years of age can significantly reduce the likelihood of child maltreatment (see [Intervention 4: Home Visiting](#) section) as well as provide other beneficial effects to mother and child. In comparison, other research has found that an intensive home visitation program starting *after* child maltreatment had appeared was not effective (MacMillan et al. 2005). Again, though not conclusive, these two studies taken together suggest that preventive programs aimed at high-risk groups may be more effective than are interventions targeting those already showing problem behaviours.

Rule 3 Intervene in multiple domains of the child's life

Research findings across a multitude of disciplines using a wide array of methodologies consistently indicate that antisocial behaviour and other problem behaviours are associated with risk factors (Office of Juvenile Justice and Delinquency Prevention 1995; Synder 1987). To the extent that these problems emerge from a complex array of risk factors occurring in multiple domains of the child's life, it is not surprising that research is increasingly revealing the futility of using single-focus interventions (Durlak 1997; National Institute on Drug Abuse (NIDA) 2004). This has led to a recommendation that prevention programs attempt to be comprehensive, addressing the many risk factors in the multiple fields that the child and his parent occupy. Our review suggests that, generally, the most pervasive and long lasting results were those which intervened effectively in multiple domains (see for instance the High/Scope Perry Preschool Project). One notable exception to this rule is found in the Parent-Child Interaction Therapy (PCIT) program which provides only parent training and still has been found to be highly effective in reducing children's future aggressive behaviours (see policy choice 6).

Even as we state this, it must be understood that while there are interventions which have implemented broad based and intensive programs found to successfully intervene in the child's life, having such a program is still not an automatic guarantee that it will be successful in lowering the likelihood of negative outcomes. As an example, the Infant Health and Development Program (McCormick et al. 1993) was modelled according to the well-known and successful Abecedarian project. It was directed at families who had given birth to children born prematurely (born 37 or fewer weeks of gestation) and with low birth weights (2,500 grams or less). It was an intensive and extremely expensive program whereby all children in the experimental group received regular pediatric and developmental surveillance, in addition to home visits and center-based educational interventions until 36 months of age. In the end, though, it was not found to have a significant positive impact upon the children in the program (Aos et al. 2004; Farran 2000).

As with all our recommendations, the following one particular best policy or practice is not, in itself, a guarantee that the program will be successful. This highlights rule 1, the importance of adequate evaluation.

Rule 4 Attention to treatment fidelity

A number of studies have demonstrated that treatment fidelity is a predictor of success (Bellg et al. 2004; Miller and Binder, 2002). Therefore, it is critical to monitor the integrity of program implementation to ensure that the treatment program was delivered as originally intended. A related issue is the quality of the professional(s) executing the intervention. Olds and his colleagues (Olds et al. 2002) studied the differences between using well-trained professional nurses and equally well-trained paraprofessionals to deliver his home visitation program (the Nurse Family Partnership Program). They found that nurses achieved better results and were more responsive than paraprofessionals when making home visits to this population of high-risk teen-age mothers.

It is important to implement interventions as they were designed. However, since research in the real world usually means some compromises along the way, it is just as

necessary to document fully and honestly how the program was executed including all the ways that its implementation fell short of what was intended. Otherwise, it could lead to the age old problem: “We never really tried it and it never really worked.”

Rule 5 The absence of substantive guidelines for the selection of specific interventions

Are there substantive guidelines that would help policymakers pick specific programs that could be counted upon to be successful if implemented with integrity? While there have been many overviews and meta-analyses of a wide array of prevention and intervention programs (Barlow and Parsons 2005; Bernazzani et al. 2001; Durlak 1997; Durlak and Wells 1997a,b; Farrington and Welsh 2005; Tremblay and Japel 2004), there continues to be a lack of consensus regarding specific programs that could be recommended for wide adoption. For instance, home visitation programs are typically very intensive and expensive. And even though some home visitation programs have been found to be successful in reducing the likelihood of negative life outcomes for children (see for instance Olds’ Nurse Family Partnership program), others have not (Kendrick et al. 2000; Sweet and Appelbaum 2004). So while rules 1 through 4 provide general and widely agreed upon guidelines for implementing a prevention program, it is still unclear which specific prevention program(s) should be implemented by policy makers.

The same pattern of inconsistent successes and failures hold for those prevention programs that are based on providing intensive preschool services (referred to in the US as “educare”). Counted among the successes are such programs as the Houston Parent Child Development Program (Johnson and Walker 1987) and High/Scope Perry Preschool Project (Schweinhart and Weikart 1997). On the other hand, there are many educare programs that have failed to achieve significant long-term results with respect to social behaviour such as the Early Training Program (Gray and Ramsey 1982) as well as the Syracuse Family Development Project (Honig et al. 1982). While the reason for program success cannot be specifically ascertained, it does seem to be due, at least in part, to the variations existing in these different preschool programs. Again, this speaks specifically to the need to clearly and honestly document the program as it was implemented so others have an understanding of what the findings mean vis-à-vis the actual program that was being tested.

In a similar vein, one cannot necessarily assume that expensive interventions will be more effective than those which are less costly. As we have previously noted (see rule 3), the Infant Health and Development Program was a broad based and expensive prevention program. Despite its high costs, it has been unable to achieve positive and long-lasting results. Another program that has not consistently demonstrated positive results is multi-systemic treatment (MST) which seeks to intervene comprehensively across the key settings within which youths are embedded – at the individual, family, peer, school and even neighbourhood levels. This is an intensive (average duration of treatment is approximately 30 hours of direct contact over 3 months), expensive and time-limited program (duration of the program ranges from to 4 months (Henggeler et al. 1993)). After several successful evaluations done by those connected to the program (Borduin et al. 1995; Henggeler et al. 1998), a meta-analysis, which included results from a replication not associated with those in the MST program failed to show significant differences between groups (Littell et al. 2005). In the mean time the program was adopted in several counties in the Netherlands and the UK. This again highlights the importance of having replications conducted by those not connected to the program (see rule 1).

A recent analysis by Aos and his colleagues (Aos et al. 2004) investigated the costs-benefits of interventions which aimed at reducing conduct problems and criminal behaviour. In line with the above, they found that some expensive interventions produced poor results while some relatively inexpensive therapeutic interventions, such as the Parent-Child Interaction Therapy (PCIT), produced beneficial outcomes.

In conclusion, one should look to implement program types that have demonstrated successes, most especially a specific program within that general type that has been well studied and found effective using rigorous research methodology. The rigor of the evaluation needs to be kept in mind when assessing how much weight to give evidence supporting its effectiveness. With that in mind, programs that target the child early in life, preferably before the problem behaviours have begun, have been found to be more effective, all things equal, than those focused upon children once they are older and their problematic behaviours have become established. Once a decision has been reached as to what program to use, program administrators should make sure to implement it as closely to its original formulation as possible but always with the researcher(s) carefully noting the discrepancies between a program as theoretically proposed versus actually executed. Finally, those implementing the program should use professionals who are highly qualified, making sure to engage in thorough and on-going training.

Which Policies Could be Considered?

The impact of any program will be affected by a variety of factors within the child and their settings. These, in turn, will affect the child's healthy development. However, we can still speak probabilistically about programs that have demonstrated greater success. Therefore, the present discussion bases its recommendations upon programs meeting the following criteria. They were (1) aimed at young children and/or their families; (2) evaluated by a high quality randomised experimental design; and (3) used long term follow-up with objective measures. Below we provide a summary of what the research literature indicates about each of seven types of interventions meeting these three evaluative criteria. These include programs that: (1) promote the physical health of mother and the child, (2) increase income, (3) increase access to existing services, (4) use home visitors, (5) include childcare, (6) include early educational enrichment through preschool and (7) improve parenting skills. Many of these interventions can easily lead to general policies directed at children and/or their families. In contrast, some of these interventions would most likely be implemented for high risk groups only, such as the home visitation programs and those programs aimed at improving parenting skills. The extent to which policies should be universally applied or directed towards selective high-risk groups is in itself an important policy decision which goes beyond the scope of this paper but should again, we argue, be based on the research literature.

Intervention 1: Promote the Physical Health of Mother and Child

Maternal Health

Research consistently finds a strong connection between the mother's health and her child's health as assessed by the child's cognitive functioning, social behaviour and physical health (Chapman and Scott 2001; Serbin and Karp 2003). Smoking, drinking or using drugs, such as cocaine or heroin, in the mother have been found to consistently relate to poor childhood outcomes. For pregnant women in extreme subpopulations, such as those who are severe substance abusers, their children are often born severely impaired in terms of motor, language and cognitive development, showing many of the signs of ADHD (Budden 1999). But even in studies conducted with samples from the general population, results indicate significant correlations between mother's alcohol, tobacco and cannabis use and the

developmental outcomes of their children (Huizink and Mulder 2006; Linnet et al. 2003). This also holds for behavioural outcomes such as ADHD and externalizing behaviour such as physical aggression (Linnet et al. 2003; Sood et al. 2001). Generally, these findings are problematic to interpret as a large number of confounders makes it difficult in non-experimental studies to control for these extraneous variables (Huizink and Mulder 2006). Animal studies, however, corroborate these findings thereby providing support for a link between mother's substance abuse and negative cognitive and behavioural outcomes in human offspring (Huizink and Mulder 2006).

Interventions aimed at improving the health of women with alcohol and/or drug problems during pregnancy have not been found to effectively impact upon their babies' early outcomes. This is probably largely due to the difficulty in changing these health-related behaviours in the (future) mothers (Doggett et al. 2005). Programs more specifically targeting women to stop smoking during pregnancy have sometimes found positive effects (Walsh et al. 2001). Where the mother is successful in desisting from smoking during her pregnancy, the incidence of low birth weight and preterm births are significantly reduced (Lumley et al. 2006). Unfortunately, it is not possible to assess the effects of smoking cessation on other domains, such as social behavioural outcomes, because the available datasets have insufficient statistical power (Lumley et al. 2006).

Improving the nutrition of pregnant women has also been found to increase the IQ scores and other cognitive outcomes of their children. This was the case when cod liver oil or iron was added to the mother's diet (Friel et al. 2003; Grantham-McGregor et al. 2000; Helland et al. 2003; Hubbs-Tait et al. 2005; Zimmermann et al. 2006). In a randomised controlled trial, where very-long-chain n-3 polyunsaturated fatty acids were added to a group of pregnant women's diets, results indicated that their children demonstrated improved IQ functioning. Once again, no information on this intervention's impact on social behavioural outcomes was reported in this study (Helland et al. 2003).

Neugebauer and colleagues (Neugebauer et al. 1999) investigated the relationship between malnutrition in the prenatal stage and antisocial behaviour in the offspring's adult life. They studied boys born in the Netherlands in 1944 during WWII, what is now referred to as the hunger winter, and compared these outcomes with boys who were born just earlier or later than the winter of 1944. Boys in the sample were classified by the degree and timing of their prenatal exposure to nutritional deficiency. Antisocial personality disorder (ASPD) was assessed when these men were examined for military draft at age 18 years (N=100,543) at which point they were given psychiatric testing. The results showed that men exposed to severe maternal nutritional deficiency during the first and second trimesters of pregnancy exhibited increased risk for ASPD (adjusted odds ratio of 2.5). Interestingly, third-trimester exposure to severe nutritional deficiency and prenatal exposure to moderate nutritional deficiency were not associated with risk for ASPD. These findings suggest that severe nutritional insults to the developing brain while in utero may be capable of increasing the risk for antisocial behaviours in offspring (Neugebauer et al. 1999).

Child Health: Improved Diet

Obviously, malnutrition is a major concern for children worldwide, especially in developing countries. However, malnutrition in the industrialized nations is less likely to result from insufficient food but rather from unhealthy diets with specific deficiencies still relatively common (Lambert et al. 2004; Unicef 2006). For example, globally, 2.2 billion people (38% of the world's population) live in areas with iodine deficiency (International Council for the Control of Iodine Deficiency Disorders (ICCIDD) 2005). For Europe, it is estimated

that 11% of the population is suffering from subclinical iodine deficiency disorders (WHO European Region 2005). Furthermore, 7.2% of children have an iron deficiency (Male et al. 2001). These data illustrate that the nutritional status of children in Western countries is still a matter of concern (Lambert et al. 2004).¹ It is also likely that children, both in industrialized as well as non-industrialized countries, come into contact with neuro-toxic metals, such as lead or mercury, which can negatively affect their health and cognitive and social development (Hubbs-Tait et al. 2005).

Various aspects of a child's physical health have been found to relate to cognitive performance. Children who are small of size for their gestational age, not being breastfed, and having either iron or iodine deficiencies as well as protein-energy malnutrition, are generally more likely to have poorer IQ and cognitive achievement and a greater likelihood to have ADHD-like symptoms (Anderson et al. 1999; Grantham-McGregor et al. 2000). However, once again we cannot infer causation from correlation as there are many extraneous variables that cannot be taken into account (Grantham-McGregor et al. 2000; Schmidt and Georgieff 2006). For instance, poor nutrition is hardly ever an isolated factor. As such, malnourished children often grow up in circumstances where they are confronted with many other risk-factors such as poverty, maternal stress, dangerous living conditions, and the presence of toxins, such as lead, which may also account for their poor cognitive and social outcomes.

Despite these limitations, a number of well-designed experimental studies have investigated the relationship between dietary supplements and cognitive performance in children. Several studies have shown that children's improved nutrition has led to higher (mainly non-verbal) IQ scores as well as other cognitive outcomes. (Friel et al. 2003; Grantham-McGregor et al. 2000; Helland et al. 2003; Hubbs-Tait et al. 2005; Zimmermann et al. 2006). Similarly vitamin-mineral supplements have also been found to improve cognitive functioning in children. Often, this is the case primarily for those who are not well nourished to begin with.

Unfortunately, apart from the previously mentioned Dutch study on the hunger winter, the recent literature studying nutrition and experimental supplementation seldom includes social behavioural outcomes (Grantham-McGregor et al. 2000). In spite of this relative lack of information, a few correlational studies suggest links between nutritional status and a child's social behaviour. Additionally, some nutritional elements, such as iron, have also been found to relate to children's temperament. Specifically, lower levels of neonatal hemoglobin and serum iron were found to be related to higher levels of negative emotionality, and lower levels of both alertness and soothability (Wachs et al. 2005). These temperamental characteristics are correlates of externalising behavioural problems in young children (Van Aken et al. 2007). One study reported that children who received iron supplements were, at the age of 12 months, more likely to show positive affect, to interact socially, and to be alert and checking their caregivers' reactions. A smaller proportion of children in the iron supplement group resisted giving up toys and were more easily soothed when upset (Lozoff et al. 2003) suggesting a possible link between nutritional status and physical aggression.

Raine, Mellingen, Liu, Venables, & Mednick (Raine et al. 2003) describe an experiment that targeted children from poor families on the isle of Mauritius. The study included 83 children who were randomly assigned between the ages of 3 to 5 years of age to an experimental enrichment program combining several interventions including proper

¹The World Health Organization publishes data on micro nutrition deficiencies at <http://indorgs.virginia.edu/iccidd/mi/cidds.html>.

nutrition, increased exercise and an educational boost. These children were matched on temperament, nutritional, cognitive, autonomic, and demographic variables with 355 children who experienced the usual community conditions (the control group). Raine et al. 2003 tested the subjects for conduct disorder when they reached 17 years of age and found that there were significantly fewer children with conduct disorder in the experimental versus control group. At the age of 23, self-reported crime in the experimental group was reduced by 34%, and there was a tendency for registered crime to be reduced to about a third of the levels of the control subjects. The researchers also found that these positive results were especially prevalent in the experimental subjects who had been malnourished at the start of the study. These findings led the authors to conclude that the nutritional component of their intervention provided the most plausible explanation for their results. However, given that the intervention consisted of three components (nutrition, exercise and education), we cannot know definitively which specific component or combination of components caused the reduction in crime.

A number of randomised controlled experimental trials in correctional facilities have also demonstrated that vitamin and mineral supplements can lead to overall decreases of up to 47% in aggressive and/or violent incidences and less serious rule violations in the US (Schoenthaler and Bier 2000) as well as in the UK (Gesch et al. 2002). A recent study investigated whether these findings could be replicated with school children from 6 to 12 years of age (Schoenthaler and Bier 2000). This study randomly allocated 80 children with disciplinary problems to either an experimental or a placebo group. Children in the experimental group received low-dose² vitamin-minerals tablets over the course of four months. Their previous findings were replicated with the authors reporting an identical reduction of 47% in the antisocial behaviour of school children in the experimental group. Additionally, they found a 13% reduction for violent behaviour for those taking the vitamin supplements. It is interesting to note that the overall reduction in antisocial behaviour was, to a large extent, due to the improved behaviour in the most problematic juveniles.

Several mechanisms may explain the relationship between nutritional status and social and cognitive outcomes. Among these possible explanations, we mention two, though the matter has not been resolved. The first finds the link between nutrition and behaviour through the improved brain anatomy and/or its improved functioning. In fact, (Raine et al. 2003), in explaining their findings (see above), suggested that the link may be via better brain functioning leading to higher IQ. However, preschool experiments leading to improved IQ did not always lead to improved behaviour (Clarke and Campbell 1998). The second possibility deals with the child as he interacts with his environment. The “functional isolation hypothesis,” states that children who are physically unhealthy do not explore their environment as actively as healthy children. Therefore they are under-stimulated leading to, among other things, lower cognitive achievement (Grantham-McGregor et al. 2000). Possibly, this lack of activity also leads to social isolation, thus, to less social interactions with others. Isolated children have less opportunity to learn how to act and react, leading to less reactions from others (both peers and adults) regarding their behaviour. The final outcome would be that they are more likely to demonstrate lower levels of social skills and higher levels of aggression.

²It contained 50% of the U.S. recommended daily allowance (RDA).

Intervention 2: Increase Family Income

Poverty has obvious implications for a child's upbringing. Furthermore, it is evident that Western societies are not immune from having their share of children who grow up in conditions of poverty. Research consistently demonstrates the harmful effects that poverty has upon children including poor outcomes in health, cognitive achievement and social behaviour (Adler et al. 1994; Costello et al. 2003; Morris et al. 2005; Rutter et al. 1998). Clearly, it is difficult to interpret these relationships in terms of causality, again due to the many extraneous variables that cannot be controlled. However, there have been experimental studies investigating the effect that earning supplements given to families have on children's cognitive, social and emotional outcomes.

Recently, a study presented findings on aggregated data from 13 employment-based welfare programs in the United States and Canada. Participants were randomly assigned to either the experimental program or to 'treatment as usual' groups. Two main approaches were tested. One was earning supplements and the other was mandatory employment services. Each study's goal was to determine the impact of their particular service on the children whose families were in either experimental or control conditions. The meta-analysis reported on a total sample size of 15,779 children, all of whom were 2 to 9 years of age at the time of randomization (Morris et al. 2005). Generally, the programs with earning supplements boosted the income of the families an average of \$1,700 per year (with the average income being \$11,854). Though some supplements resulted in an increase of as little as \$230 in annual income, others demonstrated increases of nearly \$4000 per year. The authors studied children's outcomes including school achievement, externalising and internalising behaviour, and social, behavioural and physical health indicators (Morris 2002). The outcomes used for social behaviour included positive behaviour in the classroom, social skills and externalising behaviour, internalising behaviour³ and self reported delinquency (including fighting; see for example (Huston et al. 2003)). No specific information on physical aggression was reported.

The findings can be summarised as follows (Morris 2002; Morris et al. 2005): First, children benefited from the program only if it included parental employment in combination with earning supplements. Second, there were benefits for children's cognitive achievement and smaller improvements in social behaviour, including reductions in undesirable behaviours, such as externalising behaviour. It appeared that the cognitive benefits were relatively small, with effects sizes of at most .15 after two to three years of follow-up. After four to five years of follow-up these benefits became non-significant. The effect of the programs on positive and externalising behaviour were mainly neutral, but some positive effects for the experimental groups were found in four out of five programs (Morris 2002). Third, it appeared that the cognitive benefits were largely found in those children who started the program at a younger rather than older age. Analyses indicated that an increase of \$ 1,000 led to an improvement in cognitive achievement of 6% of a standard deviation. Fourth, no health effects generally were found for the program children. Fifth, the authors report that in two programs the effects on adolescents were to some extent harmful, especially in terms of substance abuse. Additionally, information from the mothers on their children's behaviours, as well as self-reports from the adolescents, indicated an increase in the adolescents' drinking and smoking behaviour among those whose families were in the experimental group. Since having a parent (typically it is the mother in these

³Both externalizing and internalizing behaviour are usually measured with the CBCL.

studies) who is working necessarily means that they are not home with their child, studies investigating the impact of parental daily absence on child's later delinquent behaviour become critical to better understand what these results may mean. Results from the New Hope program found relatively lower levels of delinquent behaviour with children of working, and therefore regularly absent, parents (Huston et al. 2003). Other studies on the effects of mandatory working programs on child's delinquency have indicated small improvements in the child's cognitive achievement, social behaviour, and externalising behaviour (Morris et al. 2005). This is interesting in that parenting behaviour was hardly affected by the programs. One possible explanation is that program parents made larger use of centre-based childcare thereby explaining these positive findings (Morris et al. 2005). (The effects of childcare are discussed further in [Intervention 5: Child Care](#) section.) The authors conclude that fears of sending mothers to work because it might negatively impact upon their children do not seem to be supported in by these studies. However, it must be remembered that the positive results that were reported were relatively small and many comparisons did not adequately differentiate between program and control children (Morris et al. 2005).⁴ Therefore, more rigorous studies are necessary to investigate the impact that these programs have on children's development.

Intervention 3: Increase Access to Existing Services

A relatively easy policy option is to increase access to existing services. A few randomised experiments have done this and have shown mixed results. For example, the *Comprehensive Child Development Program (CCDP)*, which is largely a home-visiting program, sought to help low income parents solve their problems by helping them find their way into existing services within the community. The total cost was \$240 million over a five-year period, and it covered approximately 4,400 families. As with some other intensive and expensive programs previously reviewed, the CCDP failed to demonstrate positive effects (St. Pierre and Layzer 1999). One possible explanation lies in the quality of existing services. That is, to the extent that these existing programs' effectiveness were unknown, they may not have been sufficient (McLennan et al. 2006).

Another example using a similar approach can be found in the Sure Start Local Programmes (SSLPs), presently being used within the UK (Melhuish et al. 2005). The main goal of SSLPs is to promote the functioning of children and families by improving access to existing quality services provided within local programme areas. SSLPs are area-based programs situated in those neighbourhoods which have been identified as having high levels of deprivation. They then use a universal approach to program implementation by targeting *all* children under four, along with their families, within these well-defined areas. Implementing services in this manner limits the stigmatization that might arise from specific individuals and/or families being targeted. Another characteristic of this program is that, as a result of their local autonomy, SSLPs do not have a prescribed curriculum or specific set of services. Instead, each SSLP has extensive local autonomy concerning how it organizes its mission to improve and create services as needed, without a specification of how services are to be changed. The individual SSLPs were advised that services that are implemented should be evidence-based and were then provided with sources of information on these types of interventions (Melhuish et al. 2005).

⁴Obviously, other considerations, such as social justice, may play a role and lead to support of earning supplements.

A recent detailed study assessed the early impact of SSLPs on child and family functioning. The study assessed 12,000 9-month-old and 3,000 3-year-old children in 150 SSLP communities and a further 2,800 children (comprised of 1,500 9-month olds and 1,300 36-month olds) in 50 comparison communities in 2003 and 2004. As the allocation of communities to the experimental or control group was not randomized, the groups differed on some important variables. With that important caveat in mind, the findings were disappointing (Melhuish et al. 2005). Overall, few significant effects were detected and those that were found to be significant were small in magnitude. Additionally, and importantly, these programs found not only positive effects, but also negative ones. On the positive side, not-teen mothers of babies of 36 months self-reported less negative parenting behaviours and reported that their children demonstrated fewer behavioural problems. In contrast, teen-mothers in these SSLPs showed less verbal ability in interaction with their children, and their children showed less social competence, more behavioural problems and they scored lower on verbal ability tests. Overall, it seemed that the relatively well-to-do families within these disadvantaged neighbourhoods profited more from the SSLP, while the most disadvantaged families experienced harmful effects.

What are the possible explanations for these findings? The authors suggest several possible reasons including: 1) In practice, even though services were made available to everyone, the less disadvantaged families may have made more use of them than the more highly disadvantaged individuals within each community; or. 2) Alternately, the most disadvantaged families might have found some of these services to be not only unhelpful but stressful and even harmful. If, for instance, home visitors were not well trained, it might have served as a strain rather than a source of support and satisfaction for the most disadvantaged families leading to a lower likelihood of the intervention achieving positive outcomes with these individuals. As an aside, it is interesting to note that Olds' Nurse-family Partnership (NFP) was able to reach a high percentage of the most disadvantaged families and still achieve positive results. Supporting the above hypothesis, NFP is careful in the selection and training of their home visitors, concentrating on using nurse professionals who are extensively trained and then receive follow-up training to achieve these positive results (Olds et al. 2002); Finally, 3) There is also the possibility that SSLPs' differential effects on more or less disadvantaged individuals was due to factors associated with the caregivers. Specifically, those who worked with less disadvantaged families may have found it less stressful and more gratifying than when they worked with the most disadvantaged families (Melhuish et al. 2005).

In the second set of interventions (presented below), programs are considered that are more likely to be applied to selective populations, because they are relatively intensive and therefore might be unnecessary for higher functioning families.

Intervention 4: Home Visiting

Not all home visiting programs are successful (Kendrick et al. 2000; Sweet and Appelbaum 2004). As mentioned above, the *Comprehensive Child Development Program* failed to demonstrate positive effects (St. Pierre and Layzer 1999). Possibly, the timeframe in which the home visitation begins is critical to a program's success or failure. The *Nurse-Family Partnership* (NFP) program, which starts during the mother's pregnancy, has been found to be successful in various locations and with different racial and ethnic groups. In contrast, the *Comprehensive Child Development Program*, as well as other programs that start when children are older have not demonstrated positive outcomes (MacMillan et al. 2005), suggesting that home-visitation programs which start during a woman's pregnancy may

have a higher likelihood of succeeding in contrast to those which start later. This underscores the second rule outlined earlier: that is, the need for prevention rather than later intervention beginning as early as possible in a child's life.

One of the few successful prevention programs found in our extensive review of the literature is Olds' *Nurse-Family Partnership (NFP)*. This program targets first-time, low-income mothers at high-risk of child abuse and other social ills. It consists of intensive and comprehensive home visits by nurses beginning prenatal and lasting until the child is two years of age. The NFP program focuses on three main themes that focus on the mother and are delivered across the time in which the nurse is attached to the family. That is, promoting prenatal health behaviours in the woman; promoting sensitive, competent and caring parenting behaviour towards her infant; and promoting a positive life course for the mother. The program has been rigorously evaluated using randomized trials conducted with three different populations in three different locales within the US (New York, Tennessee, and Colorado).

The results from these three separate trials indicated that NFP participants had a range of positive outcomes relative to controls during the prenatal and post-partum periods for both the women and their children (Kitzman et al. 2000; Olds et al. 1998, 1999). For women, positive outcomes included better health, fewer subsequent pregnancies, better parenting behaviours, safer households, greater likelihood of completing their education, and decreased dependence on public assistance. Results indicated that children had higher birth weights, fewer emergency room visits and lower rates of child maltreatment. Surprisingly, the NFP program showed that beneficial effects increased over time. A 15-year follow-up conducted at the Elmira site found that children whose mothers had received the NFP program demonstrated a range of beneficial long-term outcomes, including lower rates of truancy, teen pregnancy, alcohol and drug use and delinquency (Olds et al. 1997). However, it needs to be noted that the NFP program has yet to be implemented and evaluated by independent researchers.

Intervention 5: Child Care

The effects of childcare on children's development are important to document in view of the increasing participation of women in the labour market (Kamerman 1998). Childcare is a culturally sensitive issue with many asking whether children, especially infants and toddlers, should stay with their mother or be placed in childcare. The research literature fairly consistently indicate that childcare has a positive impact on cognitive achievement (Lowe Vandell and Wolfe 2000; NICHD Early Child Care Research Network 2002, 2004) and that better quality childcare leads to better cognitive achievements (Belsky 2003; Lowe Vandell and Wolfe 2000).

However, the effects of childcare on social and emotional development are less clear. Some studies have suggested that childcare has long-term and somewhat negative effects on attachment security and social behaviour (Belsky 2003; NICHD Early Child Care Research Network 2004). This is especially true for children spending many hours per week in childcare, and has been found irrespective of the quality of the childcare (NICHD Early Child Care Research Network 2004). However, these negative effects have not been found to be very strong (Belsky 2003; Lowe Vandell and Wolfe 2000). For example, there was a two-point difference on the Teacher Report Form⁵ (TRF) between children going fewer

⁵The Teacher Report Form lists 100 problem behaviours items and three possible scores for each. It is divided in two broad subscales: internalising and externalising behaviours. So a two-point difference does not seem very important.

than 10 hours versus those going 30 hours or more for 54 month-old children. This difference declined gradually to less than one point by the time children were in third grade (Lowe Vandell and Wolfe 2000, Figure 1).

In contrast to the NICHD findings, other studies have reported positive outcomes for those children in high-risk areas whose parents use daycare. Borge, Rutter, Cote, & Tremblay (Borge et al. 2004) found that physical aggression was significantly more common in children from high-risk families looked after by their own parents than among comparable children who spent time in childcare. In low-risk families (84%), childcare had no impact on the level of physical aggression. Other longitudinal studies also reported on the positive impact of high quality childcare. Again, the beneficial effects were most pronounced for children from high-risk families (Peisner-Feinberg et al. 2001). Going further, a Swedish study found that age of entry into childcare was related to social competence as well as school achievement (Andersson 1992). The earlier children entered childcare, often before one, the better the children performed on both of these outcomes at the age of 13. It has to be noted that Swedish childcare is of high quality, and therefore these results may not generalise to other countries. It is also important to recognize that the findings of childcare's impact on the social and emotional competence of the child are based on correlational information. As far as we know, no experimental study has, as of yet, investigated long-term social behavioural outcomes.

Intervention 6: Preschool

As is the case for home-visiting programs, not all preschool interventions have had an impact on social behaviour, suggesting that it is easier to improve cognitive than behavioural outcomes in children (Clarke and Campbell 1998; Wilson et al. 2003). Most preschool programs have been able to raise cognitive achievement, but only one, the High/Scope Perry Preschool Program, has provided a long-term follow-up which has demonstrated enduring and positive effects on various childhood outcomes including social behaviour (Clarke and Campbell 1998; Schweinhart 2004; Schweinhart et al. 1993). The participants were 3-4 year-old children of low IQ African-American parents who followed the High/Scope curriculum for 2.5 hours a day, five days per week. Home visits were also performed on a weekly basis. As was the case for the Nurse Family Partnership, many positive outcomes were reported in various areas. A lengthy follow-up indicated that at the age of 40, the now adult children from the experimental group performed significantly better in many and various ways in comparison to the adult children from the control group. For instance, fewer program individuals dropped out of school or experienced grade retention. They also fared better economically than their non-program participating counterparts as indicated by their higher likelihood to have a job, earn a salary and own their own homes and their lower likelihood of being on welfare. Finally, in terms of criminal involvement, participants in the experimental group were arrested less often and, where arrested, for less violent offences than those who had been in the control group. Those in the experimental group also scored lower on a variety of additional crime indicators. A replication study has since confirmed the original study's findings of the original study. Again treated individuals fared better overall including on measures of delinquency and crime than did their control counterparts (Schweinhart and Weikart 1997)

To be sure, the High/Scope Perry Preschool Project has its detractors (Locurto 1991). Still, it remains one of the strongest supported evidence-based prevention programs written up in the research literature today. But the question remains how its long-term and positive outcomes can be explained. One possible explanation lies in how the program structured

the child's activities: Specifically, there was a strong temporal structure in the planning of activities. Within this structure the children learned according to what the researchers called a 'plan-do-review sequence': (1) *children express intentions*; (2) *children generate experiences*; and (3) *children reflect on their accomplishments* (Schweinhart et al. 1993). This 'plan-do-review' sequence is a process that can be used in all facets of life. Some, like the authors (Schweinhart 2004), have hypothesized that this is a general method by which individuals can exercise self-control in their life and was, therefore, responsible for the long-term project outcomes.

Intervention 7: Improve Parenting

Many types of interventions and therapies attempt to improve parenting skills. Few have been adequately evaluated and even less have demonstrated consistent and sizable results (Barlow and Parsons 2005; Bernazzani et al. 2001; Farrington and Welsh 2003, 2005; Tremblay and Japel 2004). Most interventions for parenting focus on older children and adolescents, at an age where behaviour is not as malleable. Again, in their review of the cost-effective interventions Aos and his colleagues (Aos et al. 2004) report that the most cost-effective intervention are those aimed at small children. The aim of the Parent Child Interaction Therapy (PCIT) program is to reduce conduct disorder in children by improving the parent-child relationship and teaching parents to use effective behaviour management skills at an early age in their child's life. The intervention consists of an average of 9–20 sessions in a clinic or laboratory setting where the parent-child interactions are restructured. The intervention uses a two-stage approach aimed at relationship enhancement (CDI-phase) and child behaviour management (PDI phase).⁶

PCIT outcome research has demonstrated significant improvements in the conduct-disordered behaviour of preschool children. Effect sizes in a two-year follow-up study were 2.32 on the intensity scale of the Eyberg Childhood Behaviour Inventory (ECBI), 2.47 on the problem score-scale of the ECBI, and 1.71 on a parenting stress scale (Eyberg et al. 2001). It is important to note that results obtained with PCIT generalize to behaviour in the classroom, according to both teacher report and classroom observation data (McNeil et al. 1991). A meta-analysis by Gallagher (2003) concluded that 'Taken together, these studies provide strong evidence for the effectiveness of PCIT' (Gallagher 2003, p. 7).

A 'light' version of PCIT for children below the clinical range has recently been piloted (Harwood 2006) and constitutes a preventive program for at-risk parents of very young children. PCIT-light consists of four group sessions with two to four parent-child dyads in each group. This PCIT version has been piloted and found effective in reducing child problem behaviour significantly in comparison with a PCIT self-instruction format.

To reach a broader audience, there are now video-taped parenting program which have been well evaluated with the best producing relatively large effect sizes up to .83 (Farrington and Welsh 2003). A nice example is the videotaped course by Sanders and colleagues (Sanders et al. 2000) who developed a 12-episode television series entitled "Families" on disruptive child behaviour and family adjustment. The potential of the mass media to improve parenting is supported by a fair amount of suggestive evidence (Saunders and Goddard 2002). Up until now this avenue has not been widely used. However, one

⁶The teacher Report Form lists 10 problems behaviours items and three possible scores for each. It is divided in two broad subscales: internalising and externalising behaviours. So a two point difference does not seem very important.

potential problem with such a program is that mass media campaigns are often difficult to evaluate because of the breadth of their implementation.

Conclusion and Discussion

This review has investigated what is known about effective interventions to prevent physical aggression and violence. This led to our proposing five rules on implementing an intervention: 1) The importance of rigorous (preferably experimental) evaluation; 2) Seek to prevent rather than to intervene and do it early in a child's life rather than later; 3) Intervene in multiple domains of the child's life; 4) Pay attention to treatment fidelity when implementing programs and, with that, the need for quality professionals who are thoroughly trained; and finally, 5) There is an absence of substantive guidelines and recommendations of specific prevention programs. With this in mind, we examined seven possible prevention strategies that have been rigorously evaluated.

Policy choice 1: Promote the physical health of mother and child Research shows that mother's health is related to the cognitive outcomes in her child. In addition, some research finds mother's health to be related to the social behaviour of her child. Additionally, the nutritional status of the child has consistently been found to relate to cognitive outcomes. Although only a few studies investigated social outcomes, the child's health also seems to be related to social behaviour. While much more research is needed to clarify the link between health and social behaviour, this line of inquiry offers a strong potential prevention program.

Policy choice 2: Increase income Experiments which made jobs and income supplements available to mothers of young children who were on welfare proved to be beneficial to children, but the benefits were very small. While there were gains in the cognitive development of children, these gains were not maintained after four to five years. Some studies have shown that children improved in terms of social behaviour. Overall, however, the findings are not very convincing that increasing income for a mother on welfare will lead to significant positive and long-lasting outcomes for the child.

Even as we note what the research indicates on increasing income, we want to be clear that improving the living conditions of the poor may be a worthy goal in and of itself. Duncan & Magnuson (Duncan and Magnuson 2004), based on findings from their experimental studies (as discussed in [Intervention 2: Increase Family Income](#) section) that income supplements have a small and short-term cognitive and social benefit for young children, formulated a reasonable policy option. They argue that maternal leave should be reimbursed at 100% for the first 6 months and that mothers should not work more than 30 hours a week for the following six months until the child is one year of age. Furthermore, they suggest that there should be generous child allowances for poor families which would continue until the child is five years of age. They stipulate that this would apply for a mother's first two children, with all additional children receiving no allowances.

An alternative option is based on the interpretation of the study done by Morris, Gennetian, & Duncan (Morris et al. 2005). Their research on income supplements led them to suggest that positive childhood outcomes were probably explained by the use of formal childcare. As a result, they argue that it would make sense to provide free childcare for young children from low-income families. Health care, childcare and (pre)school should then become available for these families at no additional costs. This would probably

increase the use of these services for high-risk children without having to implement screening procedures to identify and treat high-risk families. While we are not recommending either policy, we do advocate for additional research on the effects that maternal leave and childcare have on children's development.

Policy choice 3: home visiting Most home visiting programs have not been found to be successful, with the *Nurse-Family Partnership* (NFP) program being one of the exceptions. It has not only produced significant results that positively impact on the mother and her child, but additionally has demonstrated beneficial effects on children's long-term outcomes across many different domains (including education, professional employment, social behaviour and criminal activity). While the data from this program looks very promising, we would caution that the NFP has yet to be implemented and its results evaluated by those not connected to the program. Therefore, we must also advise prudence until it is independently evaluated.

Policy choice 4: childcare Large numbers of children make use of childcare. In European countries, these numbers are expected to continue to increase in the near future. Therefore, childcare provides a possible vehicle for reaching and assisting a significant number of children. Survey research led most researchers to agree that childcare demonstrates a positive impact on children's cognitive achievement, but they disagree whether there are positive effects on social behaviour. Studies taking into account the background of mothers reported that children from high-risk backgrounds were less physically aggressive when they were in childcare than when they stayed with their mothers. These findings suggest that policies desiring to promote positive child development should consider implementing high quality childcare, focussed especially on high-risk children.

Policy choice 5: preschool As was the case with home visiting, not all preschool programs are effective, and some preschool programs that have been found to be effective in improving cognition do not show positive results on social behavioural outcomes. An exception to this which found long-term effects was the High/Scope Perry Preschool Program. Again, given the number of women who work and must rely on childcare or preschool programs, this would seem to be a fertile avenue for increased research as, if found effective, it could be a vehicle for reaching a large number of children.

Policy choice 6: improve parenting skills Our literature review did not reveal many parent effectiveness training programs for parents of young children. The best possibility to improve parenting for young children was found in the Parent-Child Interaction Therapy (PCIT) program. PCIT is a therapy form that is indicated when parents have either parenting problems or abuse their children or, alternatively, when their child's behaviour is above the clinical range. PCIT in group format may be applied more easily in a preventive way for families which are not yet problematic.

Policy choice 7: Increase access to existing services Programs which simply increased access to existing services consistently failed to show significant improvement in children's outcomes. In fact, in some cases and for high-risk groups, adverse outcomes were reported (see [Intervention 3: Increase Access to Existing Services](#) section on the Sure Start programs). It is, therefore, clear that leading families towards existing services is not an advisable policy unless we can first be sure that these programs are effective in positively impacting on outcomes. This again establishes the need for rigorous research to evaluate programs to ensure that they don't lead to unintentional harm.

Though we have been critical of a number of preventive programs, we strongly support policies that reduce violence. Our review indicates that they constitute a good strategy for the healthy development of children. They also carry with them the possibility of impacting upon a broad range of social ills. As noted earlier, interventions found to be effective in reducing violence have also been found to impact positively on a number of other outcomes including improved social relations, health behaviours, and increased educational level and income. A recent meta-analysis of the cost-effectiveness of interventions aiming to reduce antisocial and criminal behaviour showed that the High/Scope Perry Preschool Program, the Nurse-Family Partnership, and Parent-Child Interaction Therapy were cost-effective programs (Aos et al. 2004, p115). Additionally, as physical aggression can be easily observed and measured, even in small children, it is fairly easy to target and reach the populations in need. We, therefore, argue that reducing violence is a good starting point in developing an effective and holistic integrated social policy.

Finally, it must be stressed that any social policy chosen would be more than the sum of the interventions that were reviewed. It would need to become an integrated system of care in order to improve the health and development of mothers and children. Within this system there must be special attention paid to verify whether chosen programs constitute the best options for reducing aggressive and violent behaviour. However, it is important to emphasize that some objectives are important in and of themselves and, therefore, do not need to be pursued only because they may reduce physical aggression. So, for instance, we would argue that fighting poverty and promoting health amongst children are two such objectives.

With that in mind, we continue to recommend that policy makers seek out rigorous research to help formulate their preventive policies so as to implement the most effective programs. Just as importantly, those attached to these programs must commit to allowing rigorous research methods so as to ensure that their programs are delivering on their promised benefits.

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