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The Epidemiology of Child Psychopathology: Basic Principles and Research Data

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1. Introduction

Epidemiological information is needed for developing public policies to improve children's mental health. In particular, epidemiological research could provide answers to questions such as 1) How many children in the community have mental health problems; 2) What is the distribution of mental health problems across age, sex, levels of socio-economic status, and neighbourhood disadvantage; 3) What is the information about mental health problems from different informants (parents, teachers, and the child); and 4) What is the developmental course of mental health problems in childhood (Costello & Angold, 2006)? Answers to such questions may assist policy-makers and clinicians in designing strategies for improving mental health in children.

After briefly explaining epidemiological concepts and strategies, a selective review of epidemiological research relevant to child mental health policies is given. The purpose of the second part of this chapter is to report on results of two studies. The studies were performed in order to assess the prevalence of emotional and behavioural problems from different informants, to investigate factors which may be associated with prevalence, and to determine the prevalence and incidence rates of ADHD and ODD from preschool to primary school. Of additional concern was the developmental course of externalizing behaviour problems. Finally, the implication of the epidemiological outcomes for future research and mental health services are discussed.

2. Aims of epidemiological research

The epidemiology of childhood psychopathology includes the following aims (Costello & Angold, 1995):

- to identify the onset, frequency and distribution of mental disorders and the occurrence of psychological symptoms in different population groups and regions,
- the risk-increasing factors that determine the onset and course of disorder, to determine in different population groups,
- to determine the risk mitigation factors that protect individuals at increased risk of interference from mental disorders,
- to examine the mechanisms of disturbance in individuals with increased risk for mental disorders,

- to determine the need for psychosocial support facilities and possible costs that burdens the healthcare system due to mental disorders and their consequences.

Epidemiology does not refer to a single scientific discipline or the use of one specific methodology. Instead, epidemiology derives and integrates concepts and methods from other areas such as biology, statistics, and sociology. In epidemiology, the combination of measurement principles and statistics is used for the development and testing of diagnostic assessment procedures. When applied to psychological concepts, the combination of measurement and statistics is called psychometrics. In epidemiology of child psychopathology, psychometric principles play an important role. A number of specialized areas that are derived from classical epidemiology are relevant to child psychopathology, including clinical epidemiology, genetic epidemiology, and pharmaco-epidemiology. Clinical epidemiological studies concern the development and application of diagnostic and screening tests, the prognosis of disorders, the effects of treatment and clinical decision-making.

3. Epidemiological concepts and strategies

Epidemiology is concerned with the study of the distribution and determinants of disease frequency in human populations. The quantification of the occurrence of psychopathology in populations, can be regarded the central task of epidemiology. Well-known measures of frequency are *prevalence* (see 4.1) or *incidence*. Incidence quantifies the number of new cases with a disorder that develop in a population during a specified period of time. *Cumulative incidence* is the proportion of individuals who become disordered during a specified period of time (Verhulst, 1995). The distribution of disorders, involves comparisons between different populations or subpopulations. The examination of factors that are associated with variations in the distribution of psychopathology is essential for testing etiological hypotheses. Measures of association and risk are quantifications of the influence of certain factors on the occurrence of disorder. In follow-up studies measures of risk for developing a disorder using categorical data are *relative risk*, and *attributable risk*. In case-control studies the measure often used is the *odds ratio* which reflects the likelihood for developing a disorder in the group with a possible aetiological factor versus the group without this factor (Verhulst, 1995). For a more detailed discussion, see Verhulst and Koot (1992).

Epidemiological studies can be divided into prospective and retrospective studies, depending respectively on whether the measurement of exposure to a risk factor was done before or after the disorder occurred. A study, in which the presence or absence of a disorder and the presence or absence of associated factors are assessed at the same time, is called a cross-sectional study. If the aim of the cross-sectional study is limited to the determination of the prevalence, the study is called prevalence study.

4. Prevalence studies

4.1 Basics

Prevalence can be defined as the proportion of a population that has mental health problems at a specific point in time; it is often defined as *point prevalence*. Prevalence is calculated by dividing the number of cases by the total population. It is also possible to quantify the number of cases known to have the disorder at any time during a specified period. This so-

called *period prevalence* (e.g. 6-month prevalence or lifetime prevalence) is frequently used in prevalence studies of child psychiatric conditions. There are two types of studies determining the prevalence of child psychopathology: (1) those that produce prevalence rates of psychiatric diagnoses, usually based on DSM (Diagnostic and Statistical Manual of Mental Disorders) criteria, and (2) those that generate scores on psychiatric symptom rating scales.

Many studies that determined prevalence rates of DSM diagnoses in general population samples of children have been conducted. Costello, Egger and Angold (2005), Roberts, Attkisson and Rosenblatt (1998), Verhulst (1995), and Waddell et al. (2002) provided reviews. Despite huge research efforts and many children involved, comparisons between these studies are seriously hampered by large differences in design and methodology including differences in sample size, age of children, assessment and sampling procedures, and case definition. Even for studies conducted in countries comparable in language, culture, and availability of services, differences in prevalence rates were extremely large and ranged from 10% to 20% (Waddell et al., 2002). It is more likely that these differences reflect variations in methodology than differences in true prevalence. Methodological variations and the lack of standardization among studies seriously limit the value of prevalence figures of categorical diagnoses.

The second approach, the use of rating scales for assessing parent- or self-reported emotional and behavioural problems of children in representative general population samples, is less vulnerable to methodological differences. This approach produces problem scores on continuous scales and does not generate prevalence rates for categorical diagnoses. Often, statistical criteria are used for distinguishing between cases and non-cases. Although dividing lines for caseness may be rather arbitrary, there are epidemiological methods for selecting effective cut-off points. However, prevalence figures will vary with the statistical criterion and cannot be used as absolute population prevalence measures without relating them to similar measures for other populations or subpopulations (Verhulst, 1995). In two recent multicultural prevalence studies, parents' reports and youths' self-reports of problems for children using the Child Behavior Checklist (CBCL) in 31 cultures, and the Youth Self-Report (YSR) in 24 cultures, were compared (Rescorla et al., 2007a; b). It was found that, when the same standardized assessment procedures are used for assessing children from different cultures, cultural differences per se do not lead to big differences in reported problems. Instead, individual differences within each cultural group are bigger than differences between the average scores obtained in different cultures. Assessment procedures with good cross-cultural track records and appropriate translations that capture individual differences in reliable and valid ways are apt to reflect the mental health needs of children that are robust across cultures (Achenbach & Rescorla, 2007).

4.2 Methodological Issues

A number of methodological issues of child psychiatric prevalence studies will be considered for better understanding the results of these studies. Issues that pertain to general epidemiological methodology, such as sampling and data analysis, will not be discussed here. The focus will be on issues that are specific to child psychopathology, such as assessment, diagnostic principles, and morbidity criteria.

Assessment: All assessment procedures are subject to error due to variations in the phenomena being assessed and in the procedures themselves. To reduce variations in the data obtained and to improve precision is the use of standardized assessment procedures. Epidemiological researchers in child psychiatry were among the first to use standardized assessment procedures (Rutter et al., 1970). Rating scales were developed because they could easily be applied in a cost effective way in large-scale epidemiological studies, and standardized psychiatric interviews were developed for more in-depth assessments of the prevalence of psychiatric diagnoses. Conversely, epidemiological data are indispensable for obtaining norms and for testing the validity of these instruments (Shaffer et al., 1999). Epidemiological comparisons of normal and disordered children are needed to determine how childhood disorders are actually distributed and for identifying optimal cut-offs for distinguishing between children who will most likely benefit from particular interventions versus those who will not (Fombonne, 2002; Verhulst, 1995).

There are two main approaches, the *empirical* and the *a priori* approach, to determine the level of psychopathology in individuals. The empirical approach employs multivariate statistical techniques, such as factor analysis and principal components analysis that are used to identify sets of problems that tend to occur together. These co-occurring items constitute empirical syndromes. This approach starts with empirical data derived from informants who describe the behaviour of children, without any assumptions about whether these syndromes reflect predetermined diagnostic categories. The empirical-quantitative approach forms the basis of the empirical syndromes of rating scales such as the Child Behavior Checklist (CBCL; Achenbach, 2009) or the Conners' Rating Scales (Conners, 1997). Prevalence studies using the empirical approach generate quantitative scores reflecting the level of problems of a child. Imposing cut points to the quantitative scores can make categorical distinctions between disordered and normal individuals. The second approach refers to the diagnostic categories employed by one of the two international nosological systems, the fourth edition of the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)* or the World Health Organization's *International Classification of Diseases (ICD)*. This approach starts with assumptions about which disorders exist and about which symptoms define them. Some prevalence studies generating DSM diagnoses for general population samples as discussed above used combinations of both approaches with rating scales for screening the total sample and psychiatric interviews used for assessing a selected subsample of children scoring in the problem range of the rating scales.

Multiple informants: To obtain a comprehensive picture of a child's functioning, information from different informants is needed. Many prevalence studies used information from usually parents, teachers, and the child. The reason for this is because agreement among informants is far from perfect, and because no one informant can substitute for all others. Different informants having different relations to the child and seeing the child under different conditions, often vary in their response to the child's behaviour. In a first meta-analytic study, Achenbach et al. (1987) computed the average correlation between different informants' ratings of problem behaviours in a large number of published samples. The mean correlation between pairs of adult informants who played different roles with respect to the children was 0.28 (e.g., parents versus teachers). The mean correlation between self-reports and reports by parents, teachers, and mental health workers was even lower (0.22). In contrast, the mean correlation between pairs of similar informants (e.g., father and

mother; teacher and teacher aide) was 0.60. These findings were confirmed by more recent studies (Duhig et al. 2000; Grietens et al. 2004). There are several possible explanations for cross-informant discrepancies in parent and teacher reports of child behaviour problems, including issues related to informant bias, the demands of the context in which the child's behaviour is being assessed and poor measurement reliability (De Los Reyes & Kazdin, 2005). For reasons of comparability, it is recommended that prevalence studies report prevalence rates based on specific informants separately, and that procedures for combining information from different informants will be well documented in ways that can be easily replicated.

Disagreement among informants can be valuable (Jensen et al., 1999). As example, Ferdinand et al. (2003) studied problem behaviour in adolescents from the Dutch general population, aged 15 to 18 years, across a 4-year period. Initially, parent information was obtained with the CBCL and self-reports with the Youth Self-Report. Signs of poor outcome, including police contacts and drug use, were assessed four years later. Discrepancies between information from parents and adolescents added significantly to the prediction of poor outcome based on information from each informant separately. For instance, scores on the Delinquent Behavior syndrome based on parent information or on adolescents' self-reports separately did not predict future police contacts. However, if parents reported scores in the deviant range on the Delinquent Behavior scale, while adolescents reported scores in the normal range on this scale, adolescents were at increased risk for later police or judicial contacts (Verhulst & Koot, 1995).

Morbidity criteria: Most problem behaviours in children can best be regarded as quantitative variations rather than present/absent categories. This approach allows for inter-individual differences that are normal. Abnormality can be regarded as the quantitative extreme of the normal distribution. This quantitative approach makes it possible to assess the degree to which an individual child's problems deviate from those that are typical of the individual's age and sex. In order to make such comparisons, we need data on large, representative samples of boys and girls of different ages from the general population. Despite the fact that many psychopathological phenomena in children can best be regarded as quantitative variations, for identifying individuals in the general population with mental health problems, we need to dichotomise quantitative information into categories that are defined by cut points for distinguishing between cases and non-cases. There is as yet little basis for perfect categorical distinctions between psychopathology and normality. For most problem rating scales this is done by comparing the distribution of scores for non-cases with the distribution of scores for cases. In the absence of an ultimate criterion for caseness, the most frequently used morbidity criterion is whether a child has been referred for specialist mental health services. However, caution is needed because this approach is fallible; some children who are not referred may have significant problems, while not all children who are referred really need professional help.

DSM diagnostic criteria can also be used for deciding who is disordered and who is not. These criteria are the result of negotiations among expert panels and often lack firm empirical evidence. Prevalence studies that use DSM diagnostic criteria to define caseness run into the problem that DSM criteria are overinclusive, often resulting in extremely high prevalence rates. As example, Bird et al. (1988) found that 49.5% of children in Puerto Rico met criteria for DSM-III disorders. As a result studies using DSM criteria often combine

DSM diagnostic criteria with impairment measure, for example the Children's Global Assessment Scale (CGAS; Shaffer et al., 1999). The newest versions of some psychiatric interviews such as the Diagnostic Interview Schedule for Children (DISC; Shaffer et al., 2000) and the Child and Adolescent Psychiatric Assessment (CAPA; Angold & Costello, 2000) have included impairment criteria. Because many children who meet criteria for DSM disorders are not greatly impaired in their everyday functioning, the addition of impairment measures results in a decrease of prevalence rates. In a Dutch prevalence study, for example, the prevalence of 21.8 % of children who met criteria for any DSM-III-R disorder based on parent interview information dropped to 5.9 % when combined with a CGAS score indicating definite impairment (Verhulst et al., 1997). Conversely there are also many children who can be regarded functionally impaired but do not meet criteria for DSM diagnoses. Some 50% of children attending clinics in the Great Smoky Mountains Study do not reach DSM or ICD criteria for a diagnosis and yet half of these are significantly impaired in their social functioning (Angold et al., 1999).

4.3 Factors associated with prevalence

Of many factors that have been tested for association with prevalence in general population studies, findings for gender, age, SES, and degree of urbanization will be discussed here, because those are factors with findings that have been replicated across studies (Achenbach & Rescorla, 2007).

Gender: Gender differences in prevalence are very robust across cultures, informants and across types of studies, in particular those that used rating scales and those that used DSM diagnostic criteria. Girls score higher than boys on internalizing psychopathology such as anxiety, depression and somatic complaints, and boys score higher than girls on externalizing behaviours such as attention and hyperactivity problems and aggressive and delinquent behaviours. These gender differences are found for both parent- and self-reported problems. Despite the range in cultural, economic, political and genetic differences, there is consistency in population-based findings that boys have more externalizing and girls have more internalizing problems.

Age of children and adolescents: From a developmental perspective, the effects of age on levels of psychopathology in individuals can best be studied through longitudinal studies. For public policy purposes, cross-sectional data on prevalence with age can be important for service planning. Age interacts with gender as a factor associated with prevalence. Boys show more problems than girls when they are younger, whereas girls show more problems than boys in adolescence (Achenbach & Rescorla, 2007). In a multicultural study of self-reported problems across 7 countries, both internalizing and externalizing behaviours increased with ages 11 to 18 years. In another multicultural study of parent-reported problems of children aged 6 through 11 years across 12 countries, and aged 6 through 17 years in 9 countries, externalizing problems decreased and internalizing problems increased with age (Achenbach & Rescorla, 2007). Although parents and adolescents agreed in reporting increases with age of internalizing problems, they disagreed about externalizing problems. Apparently parents are increasingly unaware of their child's externalizing behaviours with increasing age. This is probably caused by a developmental shift in type of externalizing problems, with overt physically aggressive and oppositional behaviours decreasing with age and status violations such as truancy, running away from home, and substance abuse increasing with age (Bongers et al., 2003).

Socio-economic status: Previous studies have shown that rates of psychopathology are higher among individuals with lower socioeconomic status (SES) than those with higher SES (e.g. Schonberg & Shaw 2007). Published findings regarding associations between parents' marital status, immigration, and child behaviour problems are rare, and fewer studies still have reported on these associations in early childhood (Javo et al., 2004). Achenbach and Rescorla (2007) summarize studies from 15 cultures that tested associations between scores on empirically based scales and measures of socio-economic status (SES) in large population samples. Measures of SES varied across studies, but most used the occupation and/or education of the child's parents and grouped participants into low-, medium-, and high-SES groups. A few studies also used measures of family income. Although the studies varied in statistical details, they were consistent in reporting higher problem scores for children from lower-SES than from higher SES (Verhulst, 1995; Waddell, 2002). Although this finding was consistent across studies, the effects were rather small. There are a number of reasons that may be responsible for the finding that children from lower SES are somewhat disadvantaged.

Degree of urbanization: Most studies investigating differences in prevalence rates between urban and rural populations did not find significant differences (Waddell et al., 2002). Achenbach and Rescorla (2007) conducted a detailed comparison of varying degrees of urbanization while controlling for sex, age, referral status, SES, region and ethnicity in a US national sample. Children from the most urban areas showed a slight tendency to obtain higher parent reported problem scores than children from the most rural areas. However, unexpectedly, the greatest contrast in problem scores was found between children in the intermediate categories versus those in the most rural areas, with highest scores for children in the intermediate categories.

5. Behavioural and emotional problems of kindergarten children

5.1 Background

Behavioural and emotional disturbance are very common among children and adolescents. Approximately 20 % of children in Western, industrialized countries experience the signs and symptoms that constitute internalizing (e.g. anxiety/depression, withdrawal) or externalizing (e.g. oppositional defiance, aggression) DSM-IV disorders (Tolan & Dodge, 2005). Recently, epidemiological research has begun to focus on children younger than six and to consider the clinical significance of behavioural and emotional problems of this period of the life span (Angold & Egger, 2007). A review on the epidemiology of emotional and behavioural disorders in preschool children estimated the overall prevalence of 'problematic' behaviour as lying at somewhere between 7 % and 25 % (Egger & Angold, 2006). Empirical findings illustrate a first peak in multi modal distribution of mental health service utilization in childhood in 6-9-year-old children (e.g. Campbell, 2006). This raises the question of whether child psychiatric disturbance pre-exists school attendance, but remains undetected.

In a study in the US, Wadsworth and Achenbach (2005) reported differential incidence by SES for elevated scores on internalizing and externalizing disorders. It is not yet clear whether these findings can be generalized outside of the US, and to preschool age and other informants. From a multicultural perspective, Achenbach and Rescorla (2007) specified in their comprehensive review the need for comparable data on preschool-aged instruments. The aims

of the study were 1) to assess the prevalence of emotional and behavioural problems from different informants in children aged 3-6 years old, and 2) to investigate factors which may be associated with prevalence such as demographic and socio-economic factors.

5.2 Methods

5.2.1 Participants

The study population comprised 474 families and their children attending preschools in the city of Braunschweig (Germany), a moderately sized city with 250,000 inhabitants. Families were recruited for universal and selective prevention efficacy studies of child behaviour problems. Study details for recruitment were described by Hahlweg et al. (2010) and Heinrichs (2006). Data reported here were collected at the first (pre) assessment point. The age of the parents ranged between 23 and 47 years (mothers: $M = 34.5$, $SD = 5.3$; fathers: $M = 36.4$, $SD = 6.1$). The families had between one and four children ($M = 2.0$, $SD = 0.9$). The average age of the target children was 4.5 years ($SD = 1.0$), and 53% ($n = 253$) were boys. Seventy-eight percent ($n = 219$) of the couples were married, and 27% ($n = 127$) were single parents. 200 fathers (91% participation rate) completed the questionnaire assessment at pre-test. Forty-two percent of mothers (51% of fathers) had a higher-track school leaving qualification (= 13 years of schooling), and 37% (22%) had completed medium-track school (= 10 years of schooling). The net family income was equivalent to the German average; 35% of the families were receiving social security benefits, and 7% of mothers (5% of fathers) were immigrants.

5.2.2 Measures

To assess psychopathology in children the German translation of the ASEBA Preschool Forms & Profiles (Achenbach & Rescorla, 2000) was used. The CBCL/1½-5 and the C-TRF are similarly constructed to cover an empirical range of behavioural, emotional and social function problems. Both forms comprise 99 items, and the respondent is requested to rate each item, based on the preceding two months, as 0 for *not true*, 1 for *somewhat or sometimes true* or 2 for *very true or often true*. The CBCL/1½-5 was completed by the mothers and fathers, whereas the kindergarten teachers completed the C-TRF.

The CBCL/1½-5 consists of three problem scales (Internalizing, Externalizing, and Total Problems) and seven syndrome subscales (Emotionally Reactive, Anxious/Depressed, Somatic Complaints, Withdrawn, Sleep Problems, Attention Problems, and Aggressive Behavior). The C-TRF consists also of three problem scales (Internalizing, Externalizing, and Total Problems) and six syndrome subscales (Emotionally Reactive, Anxious/Depressed, Somatic Complaints, Withdrawn, Attention Problems, and Aggressive Behavior). Studies on the German versions of the ASEBA Preschool Forms have supported the psychometric properties, showing good reliability and validity in both clinical and non-clinical populations (e.g. Plück et al., under review). Since there are no German norms available for the ASEBA Preschool Forms & Profiles, we used the norms provided by Achenbach and Rescorla (2000).

5.2.3 Statistical analysis

Prevalence rates of problem scales and syndrome subscales were calculated for mothers, fathers and caregivers based on the norms provided by Achenbach and Rescorla (2000). Prevalence rates were calculated as a proportion of children with *subclinical* behaviour

($T = 60 - 63$ for problem scales, $T = 65 - 69$ for syndrome subscales) and *clinically relevant* behaviour ($T \geq 64$ for problem scales, $T \geq 70$ for syndrome subscales). Associations between problem scale prevalence and demographic and socio-economic factors (e.g. child's age and gender, single parenthood, parents' education, family income, migration status) were carried out with Chi square statistics, and the significance level was set at $p < .01$. To determine whether children who had deviant problem scores ($T \geq 60$) were at higher risk of having a demographic (economic) factor, odds ratios (OR) and 95 % confidence intervals were calculated.

5.3 Results

Table 1 reports the prevalence rates of problem scales and syndrome subscales for different informants. In this sample, the prevalence rate of *Internalizing* problems varied from 7.3 % (fathers) to 12.0 % (mothers) in the borderline range. Across informants, about 12 - 13% of the children met the criterion of the clinical range. For internalizing syndrome scales, 5 - 6 % prevalence rates were obtained for predominantly clinically relevant somatic complaints, anxious depressive behaviour, and withdrawn behaviour. Prevalence rates of *Externalizing* problems ranged from 4.9 % (fathers) to 9.7 % (caregivers) in the borderline range. Across informants, 6 - 9% of the children met the criterion of the clinical range. For externalizing syndrome scales, marginally higher rates of aggressive behaviour (4 - 5% clinically relevant) than attention problems were found. In summary, the results indicate higher prevalence rates on internalizing than externalizing problem behaviour across informants. For *Total Problems*, rates varied from 6.9 % (mothers) to 10.8 % (caregivers) in the borderline range. For the clinical range, 5.8 % (fathers) to 11.0 % (caregivers) of the children met the criterion. Overall, total problems were more frequently indicated by caregivers compared to parents.

Scales	Borderline Range			Clinical Range		
	Mother	Father	Caregiver	Mother	Father	Caregiver
<i>Internalizing</i>	12.0	7.3	8.8	12.4	11.6	12.8
Emotionally Reactive	8.4	9.2	6.8	4.1	2.4	2.9
Anxious/Depressed	5.6	6.4	5.3	3.0	0.6	6.4
Somatic Complaints	10.1	7.3	4.0	4.3	3.1	6.4
Withdrawn	3.9	3.1	5.3	5.6	5.2	2.2
Sleep Problems	2.4	0.6	only parents	3.9	2.4	only parents
<i>Externalizing</i>	8.6	4.9	9.7	7.3	5.5	8.6
Attention Problems	3.9	2.4	4.2	3.0	2.1	3.1
Aggressive Behavior	4.5	4.3	5.5	2.8	1.2	2.6
<i>Total Problems</i>	6.9	7.0	10.8	10.3	5.8	11.0

Table 1. Prevalence rates in percentage for syndrome scales and *broad-band scales*, and different informants.

For all informants, there were no significant associations between children's age and gender in terms of prevalence of problem and syndrome subscales. Odds ratios ranged between 0.99 and 1.28 and were not significant. Chi-square analysis showed that *Internalizing* problems reported by mothers were overrepresented among mothers with lower education (< 9 years) compared to those with higher education levels (35.1% vs. 26.4 and 16.9%; $\chi^2(2) = 12.31$, $p < .01$). Fathers reported significantly more *Total Problems* with lower maternal

education compared to higher maternal education (28.3% vs. 6.5 %; $\chi^2(2) = 15.82, p < .001$). Rates of total problem behaviour were also significantly more common with lower education of fathers (< 9 years) in comparison to fathers with a higher education level (24.7% vs. 8.6 %; $\chi^2(2) = 12.72, p < .01$). Caregivers reported no significant associations between parents' education and child behaviour problems.

The prevalence of *Internalizing* problems reported by both parents was higher in low-income families (mothers: 35.5 %, fathers: 32.7 %) than in the group with an income of over 3,000 € per month (10.8 % and 9.2 %; $\chi^2(2) = 20.71, p < .001$; $\chi^2(2) = 12.14, p < .01$). The prevalence of *Total Problems* reported by mothers is comparable in this context: Children from low-income households (24.3 %) were overrepresented compared to children from higher-income families (3.2 %; $\chi^2(2) = 18.67, p < .001$). In contrast to these findings, caregivers reported more *Externalizing* problems for children from lower-income families. The results narrowly failed to reach statistical significance.

The immigrant children's adjustment reported by informants was as follows: Non-German children (rated by their mothers) had higher prevalence rates on internalizing problems than those reported for native-German preschool children (48.5 % vs. 20.3 %; $\chi^2(2) = 24.23, p < .001$). The odds ratio was 3.0 (95 %-CI 1.82-4.96). There were no significant associations between immigrant status, problem behaviour and other informants. There were also no significant discrepancies between parental marital status and prevalence rates of problem scales. The odds ratio for *Internalizing* problems in single-parent families versus dual-parent households was 1.96 (95 %-CI 1.07-2.68). The odds ratio for scoring $T \geq 60$ on *Total Problems* was 1.80 (95 %-CI 1.08-3.00) for children with single parent versus dual-parent families.

5.4 Discussion

This study was designed to determine the prevalence rates of behavioural and emotional problems for different informants among 3-6-year-old preschool children and to evaluate demographic factors which may be associated with prevalence.

In conclusion, 5 - 6 % predominantly clinically relevant internalizing problems were found. From the total of 447 children, 12 - 13 % met the criterion of the clinical range of internalizing mental health problems. Thus, an important finding across informants was higher prevalence for internalizing than externalizing problems in preschool children. Other studies in this age group have found higher rates of externalizing as opposed to internalizing problems (Bongers et al., 2003; Campbell, 2006). Therefore, this result was unexpected and might be important in understanding mental health in the preschool years. Such discrepancies may result from different assessment measures, procedures, and normative data. The use of the CBCL ASEBA preschool forms (Achenbach & Rescorla, 2000) is a particular strength of the study, as the CBCL is a well-established measure of mental health morbidity. While this advantage is important, the study was limited by the lack of representativeness. So far, no comparable studies using ASEBA preschool instruments have been published. When interpreting the results, it should be taken into account that the child mental health status was assessed by a symptom checklist questionnaire. Given a large number of subjects and multiple informants, the questionnaire approach is economical and offers useful information, but lacks the specificity and additional depth that structured psychiatric interviews might provide.

When compared with other studies of older children, many similarities are seen concerning the associations between prevalence and demographic factors. In the current study, parental education, income, and immigrant status were also significantly associated with mental health problems of preschool children. In contrast to earlier studies, we observed effects specific to internalizing problem behaviour. In this context, it is essential to underline the fundamental longitudinal results of Wadsworth and Achenbach (2005), who found more interactions of SES over time, indicating increasing socioeconomic differences for child behaviour problems. The results for odds ratios are consistent with those reported by Harland et al. (2002) for a larger range of children's age.

The results of the present study revealed that the psychopathology of preschool children was already as high as has been found in studies of school children and adolescents. An increased utilization of child mental health services by older children, who already show disturbance in preschool years, has important implications for early preschool recognition of child mental health problems and indicates the need for the prevention and development of a differentiated delivery of child mental health services for preschool children. Clinicians working in primary care, day care, or school systems need to be attentive to opportunities for early detection and intervention regarding preschoolers' emotional and behavioural problems, particularly since efficacious prevention and treatment exists for the psychopathology of young children (e.g. Weisz et al., 2005).

6. Continuity and change of externalizing behaviour

6.1 Background

Within the last century, considerable changes in the health and illness patterns of young children have been observed. One characteristic of this phenomenon, which is referred as the "new morbidity", is the growing importance of mental health concerns (Palfrey et al., 2005). Externalizing problem behaviours are the most common and persistent forms of childhood maladjustment (Campbell, 2006). Kraemer et al. (2000) reported that, at the same time, externalizing behaviours change so much in expression and frequency over the course of development that studies at any single point in development will provide only limited information or misrepresent the phenomenon. Therefore, there is a growing agreement that externalizing behaviour must be studied from a developmental perspective (Costello & Angold, 2006). The present article aims to describe the development of externalizing behaviours from preschool age to primary school.

Previous studies have investigated the development of externalizing behaviour in the general population (e.g. Bongers et al., 2004; Hofstra et al., 2000; Loeber et al., 2000). However, these studies used two different diagnostic approaches to describe externalizing problem behaviour. The *empirical approach* utilized multivariate statistical techniques to identify sets of problems that tend to occur together. This approach starts with empirical data derived from different informants who describe the behaviour of children and forms the basis of the empirical syndromes of rating scales such as the Child Behavior Checklist (CBCL; Achenbach, 2009) or the Conners' Rating Scales (Conners, 1997). The *diagnostic approach* is to take the diagnostic categories of one of the international nosological systems, the fourth edition of the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) or the World Health Organization's International Classification of Diseases (ICD). Instead of disregarding one approach for the other,

Verhulst and Koot (1995) hold the view that both approaches are needed, and that combining both by adding information from one approach that is not captured by the other may increase our knowledge of children's psychopathology (Ferdinand et al., 2004).

A classification scheme of externalizing behaviours developed by Frick and colleagues (1993) distinguishes four types of externalizing behaviour problems based on a meta-analysis of 60 studies involving more than 28,000 youth. The four behavioural clusters that emerged may be ordered along two independent dimensions (overt vs. covert; destructive vs. non-destructive) and were labelled opposition, aggression, property violations, and status violations. These behaviour clusters were also confirmed in independent studies of adolescents. Most mental health practitioners and researchers distinguish between two types of childhood conduct problems based on the age at which children show first symptoms and the persistence of the symptoms across development (Moffitt, 2003). The differentiation between childhood-onset and adolescent-onset conduct problems is based on results from the Dunedin Multidisciplinary Health and Development Study, a 30-year longitudinal study of 1,000 New Zealand youths (Moffitt et al., 2001). Moffitt et al. (2001) identified two developmental pathways for childhood conduct problems: the life-course persistent path and the adolescence-limited path. Children with life-course persistent conduct problems first show symptoms in preschool or early primary school. Partly consistent with this theory, four developmental trajectories were identified for boys' externalizing problems from ages 2 to 8 and 6 to 15 years in two samples (Nagin & Tremblay, 1999): a *persistent problem* trajectory, a *high-level desister* trajectory, a *moderate-level desister* trajectory, and a *persistent low* trajectory. In addition, Campbell et al. (2006) identified for physical aggression from 24 months to age 9 the following trajectories: very-low, low-stable, moderate-decreasing, moderate-stable, and high stable aggression. Schaeffer et al. (2003) identified four somewhat different pathways of antisocial behaviour from first to seventh grade within an epidemiological sample of boys: *chronic high*, *moderate* (and stable), and *increasing aggression* trajectories as well as a *nonaggressive* trajectory. Early, persistent externalizing problems (e.g. aggression), however, predicts a range of negative outcomes including poor emotion regulation and impulsive behaviour, school failure and dropout, peer problems, and adolescent delinquency (Patterson et al., 1989; Tremblay, 2000).

Studies, in which researchers employed the empirical approach, have shown that between ages 2 and 9 children generally decline on externalizing behaviour measures (NICHD Early Child Care Research Network ECCRN; Shaw et al., 2003). Bongers et al. (2003) also found a decline in mother-reported externalizing behaviour problems for both boys and girls between ages 4 and 18 in a representative sample of over 2,000 Dutch children. The aims of the study were 1) to assess the prevalence and incidence of externalizing behavioural problems in children from kindergarten to primary school, and 2) to investigate the developmental course of externalizing behaviours.

6.2 Methods

6.2.1 Sample and design

In the present study, families with children aged 3 to 6 years were recruited in preschools in the city of Braunschweig (Germany), a moderately sized city with 250,000 inhabitants. Families were recruited for a universal prevention efficacy study of child behaviour problems. Study details for recruitment were described by Hahlweg et al. (2010). We first

contacted all potentially eligible preschools ($N = 33$). Project staff members were present at preschool teacher meetings and explained the project. Twenty-three preschools (70 %) expressed interest in participating in the project. Seventeen of these preschools were then randomly selected to participate in the project, and then preschools were randomly assigned to either the intervention or control condition.

The study population comprised 136 control preschool children. The baseline demographic characteristics of the 136 children and their families were follows: The age of the mothers ranged between 23 and 57 years ($M = 35.0$, $SD = 5.4$). The families had between one and five children ($M = 2.0$, $SD = 0.9$). The average age of the target children was 4.1 years ($SD = 1.1$), and 51% ($n = 69$) were girls. 33 % ($n = 46$) of the children lived with single parents. Fifty-three percent of mothers had a higher-track school qualification (= 13 years of schooling), and 32 % had completed a medium-track school (= 10 years of schooling). The net family income was equivalent to the German average; 33 % of the families were receiving social security benefits, and 8 % of mothers were immigrants.

The developmental course of child behaviour problems was established with self-report measures from mothers at pre, 1, 2, 3 and 4 years after the first assessment (follow-up 1 - 4). Across the four years after pre-test, 2 - 4 % of the families dropped out of the study, leaving 122 families (retention rate 90 %). The sample size at the 4-year follow-up assessment (primary school) consisted of 62 boys (50.8 %) and 60 girls. The mean age of the children was 8;8 years ($SD = 1;1$; range 6;3 - 10;8 years).

6.2.2 Measures

At pre-assessment, families provided information regarding their age, nationality, relationship to the child, education level, employment, receipt of social welfare assistance, and household income. They also provided data on the age and gender of the child of interest and any siblings.

Child mental health was measured during the preschool years by the German version of the Child Behavior Checklist (CBCL/1½-5; Achenbach & Rescorla, 2000; see 5.2.2). A recent study tested the generalizability of the seven-syndrome model in 23 societies (Ivanova et al., 2010). Findings from this study indicate that researchers (clinicians) can use the syndromes to assess preschool psychopathology. For the 2-year follow-up and after, the Child Behavior Checklist 4-18 (Arbeitsgruppe Deutsche Child Behavior Checklist, 1998) was used. The scores from the parent-report were classified according to the manual into age- and sex-dependent categories which are based on the percentiles of the normative study.

The German ADHD Rating scale (FBB-HKS) is part of the comprehensive Diagnostic System for Mental Disorders in Childhood and Adolescence (DISYPS-KJ; Döpfner & Lehmkuhl, 1998) and can be rated by parents and teachers. This ADHD rating scale includes 20 items addressing symptom criteria of both ICD-10 and DSM-IV as well as additional criteria assessing symptom onset, symptom duration, pervasiveness and functional impairment. Internal consistencies were satisfactory to very good in the different representative samples (Döpfner et al., 2008). The DSM-IV recognizes three subtypes of the disorder - the predominantly inattentive type, the predominantly hyperactive-impulsive type and the combined type. Children were diagnosed with any ADHD if parents reported that six or more symptoms had persisted for at least 6 months.

The German Conduct Disorder Rating scale (FBB-SSV) is also part of the comprehensive Diagnostic System for Mental Disorders in Childhood and Adolescence (DISYPS-KJ). The rating scale includes 23 items using the symptom criteria of both the ICD-10 and DSM-IV, as well as additional criteria (e.g. symptom onset). Studies have supported the instrument's psychometric properties, showing good reliability and validity in both clinical and non-clinical populations (Döpfner et al., 2008). Children were diagnosed with oppositional defiant disorder (ODD) if parents reported that four or more symptoms had persisted for at least 6 months. All questionnaire assessments were conducted at five assessment points: pre-test, and 1, 2, 3 and 4 years after the first assessment (follow-up 1-4).

6.2.3 Statistical analysis

Prevalence rates of the Externalizing problem scale during the preschool years were calculated for mothers based on the norms provided by Achenbach and Rescorla (2000). Prevalence rates were calculated as a proportion of children with *subclinical* behaviour ($T = 60 - 63$) and *clinically relevant* behaviour ($T \geq 64$). From the 2-year follow-up, the CBCL 4-18 with representative German norms was used. Percentages of ADHD and ODD mental health problems were calculated for all assessment points. Incidence rates are based on cumulative incidence for time periods as follows: pre-FU1, pre-FU2, pre-FU3, and pre-FU4.

6.3 Results

Figure 1 reports the prevalence rates of the CBCL-Externalizing problem scale and DSM-IV ADHD- and DSM-IV ODD-disorders for each assessment point. In this sample, the prevalence rate of *Externalizing* problems in the borderline and clinical range varied from 7.5 % (FU1) to 30.8 % (FU2). In primary school, about 22 % of the children were identified as having clinically significant externalizing behaviour problems. There was an increase over time in prevalence of 11 %. Significantly more children had externalizing problems during the primary school years than in the preschool years: 11.3 % vs. 30.8 % (FU2; $\chi^2(1) = 12.3, p < .001$), 22.0 % (FU3; $\chi^2(1) = 16.3, p < .001$, and 22.9 % (FU4; $\chi^2(1) = 10.4, p < .001$). For *ADHD disorders*, prevalence rates between 6 % and 10 % were obtained. Chi-square analysis showed that the gain of prevalence in attention deficit-/hyperactivity disorder over time failed to reach statistical significance. Prevalence rates of *ODD disorder* ranged from 7.4 % (FU3) to 10.5 % (FU1). There were no significant increases in prevalence rates.

The incidence rates for the CBCL-Externalizing problems and DSM-IV ADHD- and DSM-IV ODD-disorders are shown in Figure 2. This represents the *cumulative incidence* for the time periods from first assessment (pre) to each follow-up (FU1-FU4). Incidence for externalizing problems ranged from 4.5 % to 22.5 %. The highest incidence was present in the period two years after the pre-assessment. Infants had an incidence of 15-16 %. Lower rates in the DSM-IV-ODD were found, ranging from 3.5 % to 6.1%. Incidence for oppositional defiant disorder decreased from kindergarten to primary school. These findings are comparable to the incidence of DSM-IV-ADHD. The lowest incidence was 2.3 % (pre-FU2), the highest incidence was 4.8 % (pre-FU4). In summary, the results indicate higher incidence rates on externalizing behaviour problems established by the empirical approach than externalizing behaviour problems based on diagnostic categories of DSM-IV.

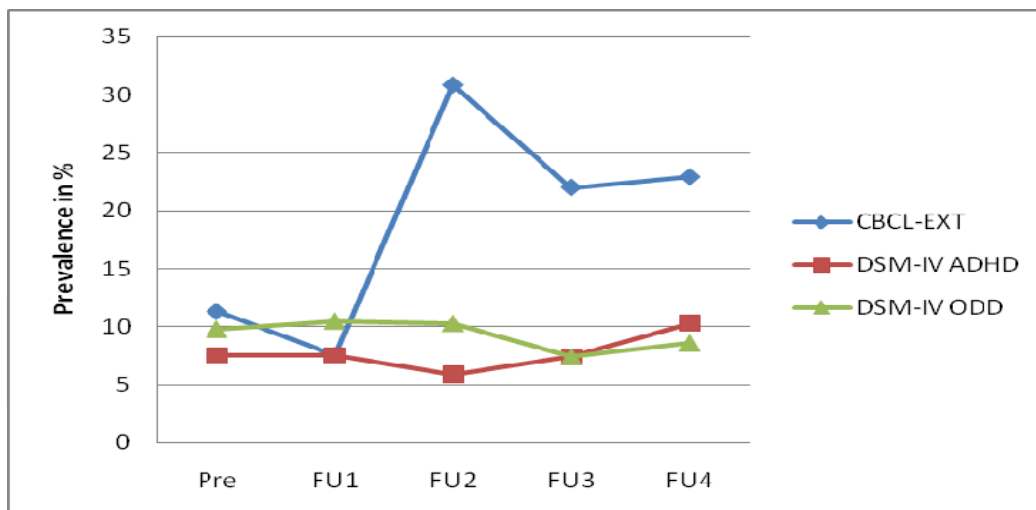


Fig. 1. Prevalence rates of externalizing problems and DSM-IV-disorders

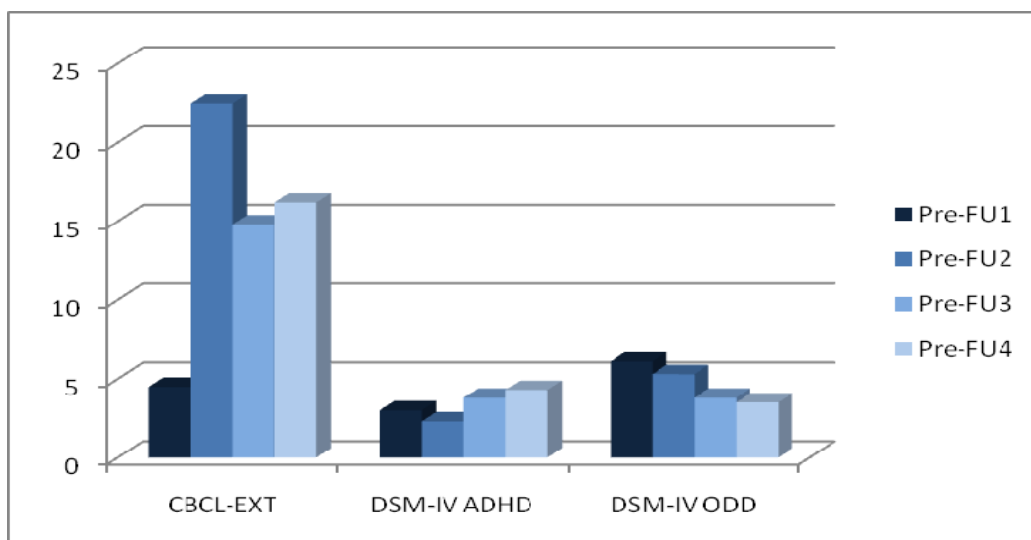


Fig. 2. Incidence rates of externalizing problems and DSM-IV-disorders

The developmental course of externalizing behaviour problems is presented in Table 2. Table 2 includes the developmental patterns of CBCL-Externalizing problems, DSM-IV ADHD- and DSM-IV ODD-disorders. Overall, we found three different patterns: the first group is *stable normal* – for each of the five assessments no borderline and clinical scores on the Child Behavior Checklist or no diagnoses of ADHD or no diagnoses of ODD were obtained. The second group of children is *temporary clinical* – for at least one assessment borderline and clinical scores on the Child Behavior Checklist or a diagnosis of ADHD or a diagnosis of ODD was seen. The third group (*stable clinical*) showed relevant externalizing symptoms on the Child Behavior Checklist or ADHD-diagnoses or ODD-diagnoses for at least four of five assessments.

On the CBCL Externalizing scale 61.0 % of the sample was stable normal; from preschool to primary school, mother’s report resulted in T-scores < 60. In addition, 31.6 % of the children had deviant CBCL scores for at least one assessment point. The stable clinical-pattern (remaining deviant at least four times) occurred in 7.4 % of the sample. In

comparison with rates of ADHD- and ODD-disorders in childhood, the percentage of children in the group “temporary clinical” was relatively high. Regarding the ADHD-disorders and as shown in Figure 3, 83.8 % of our sample was stable normal and showed no clinical relevant ADHD-symptoms over the course. Overall, 12 % of children met at least at one assessment time the criteria for a disorder of ADHD. For 3.7 % of the sample the *stable clinical* pattern was observed. These children met on at least four occasions the criteria for a DSM-IV ADHD disorder. We found similar results in terms of oppositional deviant disorder: Stable normal behaviour was seen in 80.1 % of the sample. The percentage of the *stable clinical* pattern (3.7 %) corresponds with that for the rate of attention deficit-/hyperactivity. Only in relation to the temporary clinical course was a slightly higher rate (16.2 % to 12.5 %) observed.

Developmental pattern	CBCL-EXT	DSM-IV ADHD	DSM-IV ODD
Stable normal	61.0	83.8	80.1
Temporary clinical	31.6	12.5	16.2
Stable clinical	7.4	3.7	3.7

Table 2. Developmental course of externalizing problem (CBCL EXT) behaviour and DSM-IV-disorders. Data in percent.

In summary, the results showed that about 80 % to 84 % of the preschool children were stable normal with regard to the development of ADHD- and ODD-disorders. However, when only CBCL externalizing scores were taken into consideration the rate decreased from 80 % to 60 %. In about one third of the sample temporary clinical CBCL Externalizing scores were observed. In contrast to results for the diagnostic categories of DSM-IV these rates are two-fold higher. Regarding the stable clinical pattern from preschool to primary school, 4 % of the children fulfilled the criteria for an ADHD- or an ODD-DSM-IV disorder.

6.4 Discussion

In summary, with regard to the empirical approach a considerable variation and a significant increase in the prevalence of externalizing problems were found. The results for preschool aged children correspond with other German findings reported by Beyer and Furniss (2007). Within the BELLA study, a representative national sample of children and adolescents was surveyed (Ravens-Sieberer et al., 2008). Parent’s report on externalizing problems in children aged 7-10 indicated a slightly lower prevalence than in the current sample. In a multicultural study on the CBCL, Externalizing scores generally decreased with age (Achenbach & Rescorla, 2007). A review by Rescorla et al. (2007a) included data from 31 societies. Therefore, our findings were unexpected and might be important in understanding mental health in the preschool and primary school years. Discrepancies were attributed to different assessment instruments, sample procedures, use of cut-off points, and normative data. In this study, prevalence rates of 7 - 10% for the diagnoses of ADHD according to DSM-IV symptom criteria were found. When compared with a representative German sample (Döpfner, Breuer, et al., 2008), similarities are seen concerning the prevalence in the age group 7 -10 years. Our prevalence rates are also in line with results found in other countries and cultures and with other assessment instruments. In their international review, Polanczyk et al. (2007) found an overall rate of 5.3 % and a rate of 4.6 %

for Europe in general. The findings of this study support the assumption that studies without a definition of impairment had significantly higher prevalence rates than those with a definition of impairment. Besides, the diagnostic approach on oppositional defiant disorder in the preschool and primary school years has yielded prevalence rates ranging from 7.4 to 10.5 %. These results are consistent with the lifetime prevalence of ODD reported by Nock et al. (2007), who found a rate of 10.2 %. Prevalence estimates in previous studies have yielded a wide range from 2 - 15% (e.g. Loeber, Burke et al., 2000). Our prevalence is concordant with those of another European study on preschool children. Furthermore, although considerable research exists on ADHD and conduct disorder, information regarding ODD is limited.

So far, no comparable studies reporting incidence rates on externalizing behaviour have been published. In the absence of sufficient comparison studies it is not yet clear whether the findings reported here can be generalized. Further research is urgently called for to answer this important question. Therefore, incidence rates and the developmental course of externalizing problem behaviour are considered together.

On the CBCL about 7 % of preschool and primary school children showed a stable pattern of relevant externalizing problem behaviour. A recent study by van Lier et al. (2007) assessed the trajectories of parent-rated symptoms of conduct problems from age 4 to 18 years old also in a general population sample. In this broader age group slightly lower rates (4 - 5 %) of a high trajectory of ODD- and ADHD-symptoms were found. A thorough statistical analysis of trajectories through growth mixture modelling on a large sample size of Dutch children yielded these results. The discrepancies in findings from those in the present study were attributable to different age groups, data collection and recruitment procedures, and CBCL-versions. The results on the stable normal pattern are in line with data from the literature (Bongers et al., 2003; Keiley et al., 2000).

The study had several strengths. First, it is one of the rare studies with preschool children conducted in a universal setting with a 4-year follow-up over that time span. Second, the time intervals between the assessments were shorter compared with other longitudinal studies examining the same topic. Third, we used two different diagnostic approaches to describe externalizing problems: one of the best-studied instruments for the evaluation of children's psychopathology (Achenbach, 2009) and DSM-IV ADHD- and ODD-diagnostic criteria. In this context, the study met for the most part the methodological criteria previously suggested by Robins and Rutter (1990), since it investigated behavioural problems in a sample of the population assessed longitudinally through standardized procedures. The present study is not without limitations. A main limitation is the generalizability of findings. Our sample is relatively advantaged with only 1/3 of all potentially eligible families participating. This finding corresponds to the fact that the rates of families and children recruited for family-focused preventions are typically very low (e.g. Spoth & Redmond, 2000). When interpreting the results, it should be taken into account that the child mental health status was assessed by symptom checklist questionnaires and disorder rating scales. The use of maternal self-report on child behaviour ratings may have been affected by the mother's experience of stress, depressive symptomatology, or marital problems. Given a large number of subjects, the questionnaire approach is economical and offers useful information, but lacks the specificity and additional depth that structured psychiatric interviews might provide.

Furthermore, a teacher perspective could add valuable information about problem behaviour at school, which might possibly result in reports of more externalizing problems. Due to principles of data collection, frequent change of teachers, and the transition from kindergarten to primary school it was only possible to obtain the parental report. For international comparison of the results, the age at school entry in Germany, generally at the age of 6 years, needs to be taken into account.

To sum up, the study contributes to a more complete understanding of externalizing behaviour problems and their continuity from kindergarten to primary school. The results point to the need for early child psychiatric research on child mental health beginning in infancy and the preschool years. The development of problem behaviour in specific clinical or risk groups may differ from the pattern found in the present data. An increased utilization of child mental health services by older children, who already show disturbances in the preschool years, has important implications for early preschool recognition of child mental health problems and indicates the need for the prevention and development of a differentiated delivery of child mental health services. Clinicians working in primary care, day care, or school systems need to be attentive to opportunities for early detection and intervention regarding preschoolers' externalizing behavioural problems, particularly since efficacious prevention and treatment exists for the psychopathology of young children (e.g. Weisz et al., 2005).

7. Conclusion

Since the first child psychiatric epidemiological studies in the 1950's and 1960's, epidemiological research has provided a wealth of empirical findings that may aid develop strategies for improving the mental health outcomes of children. Descriptive epidemiological data on prevalence rates, historical trends, and outcomes of mental health problems can help planning mental health services for children and provide evidence for setting priorities when resources are limited. Etiologic epidemiological research forms the basis for prevention interventions by unravelling the causative mechanisms in the development of psychopathology. Clinical epidemiological strategies are important for more evidence-based approaches to diagnostic assessment and intervention strategies, and outcome research may help improving the quality of mental health services. Finally, more efforts should be put into improving partnerships between epidemiological researchers and prevention specialists and between epidemiological researchers and policy-makers for improving strategies for preventing and treating mental health problems in children.

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This book represents an overview on the diverse threads of epidemiological research, brings together the expertise and enthusiasm of an international panel of leading researchers to provide a state-of-the-art overview of the field. Topics include the epidemiology of dermatomycoses and *Candida* spp. infections, the epidemiology molecular of methicillin-resistant *Staphylococcus aureus* (MRSA) isolated from humans and animals, the epidemiology of varied manifestations neuro-psychiatric, virology and epidemiology, epidemiology of wildlife tuberculosis, epidemiologic approaches to the study of microbial quality of milk and milk products, Cox proportional hazards model, epidemiology of lymphoid malignancy, epidemiology of primary immunodeficiency diseases and genetic epidemiology family-based. Written by experts from around the globe, this book is reading for clinicians, researchers and students, who intend to address these issues.

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