Cross-Cultural Epidemiology on Drug Abuse.

Phase I

Final Report

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Abstract

Cross-national comparisons of developmental psychopathology provide insights into how risk and protective factors, which mediate or moderate the developmental pathways, operate differently across cultures or societies. Selected hypotheses on cross-national differences can be tested from retrospective reports, before designing a more complex multi-national longitudinal study. This monograph introduces a model of developmental psychopathology, with cross-cultural variations being a product of differential impacts of environmental mediators and moderators, in addition to potential genetic differences. We then examine cross-national variations in the pathways from childhood conduct syndrome to adult antisocial personality, alcohol abuse, and drug use problems, utilizing general-population epidemiologic surveys with a uniform assessment from the United States (St. Louis), Canada (Edmonton), New Zealand (Christchurch), South Korea (Seoul and rural areas), and Taiwan (towns and rural areas).

To avoid imposing a Western diagnostic system, latent transition analysis (LTA) was extensively employed, augmented by logistic regression methods and the structural equation modeling. Response patterns and the latent class structure of childhood conduct syndrome were more varied across society and gender than the latent class structure of adulthood antisocial personality, alcohol abuse and drug use problems. The basic premise of the multiple-pathway model was replicated in all international sites; however, the magnitudes of association of childhood conduct syndrome with antisocial personality behavior, alcohol abuse and drug use problems varied by society and gender. Overall, differences are most pronounced across gender and the West-East distinction. Nonetheless, some differences were also found between Korea and Taiwan, and between New Zealand and other two Western sites (St. Louis, U.S.A., and Edmonton, Canada).
An examination of indicators of childhood conduct syndrome, adult antisocial personality, alcohol use, and drug use problems suggested that the uniform measurement approach is more useful for cross-cultural comparisons of relatively common behaviors. Future cross-cultural research needs to explore the areas of the assessment of societal specific unique measures, a new method of cross-cultural validation of semantically different measures, and a flexible sampling method to assure sufficient variations of response patterns to the measures assessed.
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Chapter 1.

Introduction

In the United States and elsewhere, substance abuse research traditionally has been problem-oriented. Research interests develop and flourish when a substance abuse problem becomes known in a specific locale, region, or a society at large. It is no surprise then that substance abuse research in the United States advanced very rapidly in the past several decades, given the development of drug epidemics since the 1960's into what now may be characterized as an endemic condition.

In the framework of observational epidemiology, a classical experimental method, which uses pre- and post-experiment measurements by assigning individuals to experimental and control conditions, is seldom applied. In the case-control paradigm of epidemiology, cases and controls are typically chosen on the basis of post hoc assessment of those who are affected (cases) or not affected (controls) by a disease or a problem. Controls are necessary to assess the causes and risk factors of a disease or problem among cases. Such a paradigm, therefore, can be problematic in identifying factors that protect people from becoming cases, when substance abuse problems are endemic in the population.

One thrust of the research we report on in this monograph is to get around the problem of the “endemic” population, by applying a cross-cultural framework to the general understanding of the multiple pathways of developmental psychopathology, and extending this model to empirical research in international settings where societies with contrasting levels of substance abuse were included to mimic a case-control design.

To link observed levels of substance use and abuse to underlying forces that differentially operate across societies, three assumptions are threaded throughout the research reported here. First,
we assumed that the developmental process has some discernible stages across individuals. Second, in studying developmental trajectory leading substance abuse, it is fruitful to employ a well-known psychopathologic construct that first appears in childhood, which is known to be highly associated with substance abuse through replicated studies in the Western societies. We chose childhood conduct and behavioral syndrome as one such major risk factor for the development of substance use and abuse. International research that has systematically assessed such childhood psychopathology has been relatively rare. Thus, we examined the level and severity of conduct problem syndrome across societies.

Third, we postulate that the maladaptive developmental pathways leading to substance abuse or other forms of psychopathology are mediated or moderated in response to the influences of environmental factors, or as a result of stage-specific differential gene expressions, including those expressed in interaction with environments. While we do not directly assess these factors, we examine differential transitions from childhood conduct problem syndrome to substance abuse and antisocial personality. Because a number of conceptual, methodological, and logistical challenges are involved in designing a cross-national project to study culturally specific risk and protective factors, we consider the research reported in this monograph to be a first step in moving toward a more complex multi-national longitudinal study where culturally specific environmental factors can be examined in detail. Indeed, strengths of the current research include its design that allowed testing major hypotheses for cross-national differences in childhood conduct syndrome and its transition to the adult form of antisocial personality and substance abuse, enabled by the use of retrospective reports from extant large-scale surveys. Thus, results from this research assure that our model of developmental psychopathology can be applied to more elaborate international research in the future,
as well as providing guidance for specific modifications that will improve the scientific yield of international research.

In Chapter 2, we examine first our three assumptions. We attempt to summarize the developmental psychopathology approach we have taken, which was developed based on the Western approach. Then we attempt to extend this model to cross-cultural settings as a background conceptual model for the remainder of this monograph. Chapter 3 begins with our justification for the value of international/cross-cultural research in the context of the rapidly shifting demographic landscape of the United States. The challenges in international or cross-cultural research, nonetheless, are many, despite the need for such research to better understand the etiological factors for endemic substance use problems in the United States. Two opposing ideological and methodological positions are introduced to highlight some of these challenges and to show how the subsequent research fits into international/cross-cultural research of the past.

Subsequent chapters are devoted to the empirical research carried out. Given the broad conceptualization of developmental psychopathology and its cross-cultural extension, the scope of the current phase of the international/cross-cultural epidemiologic research was set more narrowly: First, across societies with varying levels of substance use, we wanted to examine if the variations in the conduct and behavioral syndrome would also be observed. Secondly, we wanted to examine if variations in transitions to adult substance abuse and antisocial personality would also exist in a fashion would that lend to interpretation of a differential impact of risk and protective factors.

To realize these empirical research aims, we utilized five uniformly assessed general-population epidemiologic surveys from the United States (St. Louis), Canada (Edmonton), New Zealand (Christchurch), South Korea (Seoul and rural areas), and Taiwan (towns and rural areas). Population
descriptions, sampling methods, and description of the samples from these five surveys, and measures used in the major analyses are provided in Chapter 4. Chapter 5 introduces analysis and estimation methods adapted for the current research. Three approaches, the latent class approach, regression approach, and structural equation modeling (SEM), are reviewed. Latent transition analysis (LTA) was used extensively to avoid imposing a Western diagnostic system, which may have a varying level of applicability to non-Western societies. It also allowed specific cross-cultural hypothesis testing. The basics of the latent class approach are presented in Appendix A; rationale, estimations, and problems encountered in analyses of SEM are reported in Appendix B.

Chapters 6, 7, and 8 report results. Chapter 6 focuses on cross-national variations of childhood conduct syndrome and its transition to the adult form of antisocial personality (ASP). Chapter 7 reports results on transitions from childhood conduct syndrome to alcohol use to alcohol abuse in a combined three-stage model. Chapter 8 reports on transitions from childhood conduct syndrome to drug use, and to drug use problems using separate two-stage models. For all three chapters, results of selected cross-cultural hypotheses tested are reported. Appendix C lists all questions used for analyses reported in Chapters 6 through 8, and Appendix D includes frequency distributions of all of observed measures that were derived from the questions.

The monograph concludes with Chapter 9, which provides a summary overview of findings, comments on the limitations of the current research, and suggests future directions for cross-cultural and international research on substance abuse. The basic premise of the multiple-pathway model was replicated in all international sites. At the same time, our relatively formal hypothesis testing strongly suggested that the magnitudes of association of childhood conduct syndrome with antisocial personality behavior, alcohol abuse, and drug use problems varied by society and gender. The
uniform measurement approach taken allowed such a formal means of examining cross-national similarities and differences. Nonetheless, such an approach is more useful for cross-cultural comparisons of relatively common behaviors. Future cross-cultural research needs to explore the areas of assessment of societal-specific unique measures, a new method of cross-cultural validation of semantically different measures, and a flexible sampling method to assure sufficient variations of response patterns to the measures assessed.
Chapter 2.

Developmental Psychopathology and Substance Abuse

The motivation behind the research reported in this monograph rests on two assumptions: that the developmental process has discernible stages across individuals, and that this process is mediated or moderated in response to the influences of environmental factors, or stage-specific differential gene expressions, including those expressed through interaction with environments. A long tradition of research exists that has applied these two assumptions, either explicitly or implicitly. In this chapter, we summarize the developmental psychopathology approach we have taken. As our developmental model is based on the Western approach (Glants & Pickens, 1992), we then extend the model to cross-cultural settings as a background conceptual model for the remainder of the monograph.

Childhood Behavioral Problems

Among the common forms of psychopathology that first appear in childhood, behavioral and conduct problems are the most frequent reasons for referral to mental health professionals in the United States. Measures of childhood behavioral and conduct problems selected in commonly used assessments or criteria (Rutter, 1967; Achenbach, 1978; Achenbach, 1979; American Psychiatric Association, 1980; American Psychiatric Association, 1987; American Psychiatric Association, 1994; Robins, Helzer, Croughan, Williams, & Spitzer, 1981) show that the range of assessed behaviors vary considerably: At the core lie extreme behaviors such as cruelty to animals and people,

fire setting, and robbery; however, less severe forms such as hyperactivity also are considered as part of symptom clusters involved in this syndrome. In Western societies, well-established associated behaviors include substance abuse and criminality (Loeber & Dishion, 1994; Buka, & Earls, 1993; Robins, 1978).

Although these behaviors are stable over the developmental course, a considerable proportion of children recover from such a syndrome by adulthood (Loeber, 1982; Loeber, 1988). The effects of both environmental factors and developmentally specific gene expressions therefore can be inferred.

**Etiology of Childhood Behavior Problems**

Arguments for the biological etiology of conduct and behavior problems and delinquency have long been made (Sheldon, 1949; Earls, 1987). The field of behavioral genetics has demonstrated the existence of a substantial genetic component for criminal and antisocial behavior, as well as the importance of gene-environment interaction (Crowe, 1974; Cloninger & Gottesman, 1987). Studies of children have shown a weaker but significant genetic component (Edelbrock, Rende, Plomin, & Thompson, 1993; Schmitz, Cherny, Fulker, & Mrazek, 1994), as well as an interaction with environments (Eaves et al., 1993).

To date, the results of the search for aggression genes have been only partly promising (Brunner, et al., 1993; Crabbe, Belknap, & Buck, 1994) Among a dozen biological measures of aggression and antisocial behavior (Program on Human Development and Criminal Behavior, 1990), the hormone testosterone has been considered one of the strongest candidates (Olweus, Mattson, Schalling, & Low, 1988; Udry, 1990) However, negative findings based on studies of children (Constantino, 1993; Halpern, Udry, Campbell, & Suchindran, 1993) cast doubts on testosterone as a biological
cause of aggression. More noteworthy are findings from human and animal studies showing a connection between serotonin deficit and aggression and impulsiveness (Coccaro, 1992; Botchin, Kaplan, Manuck, & Mann, 1993; Virkkunen et al., 1994).

**Childhood Behavioral Problems and Substance Abuse**

Evidence has accumulated that, at least in the United States, children with behavioral and conduct problems are particularly at risk for developing severe adult malfunctioning in the areas of drug and alcohol use and abuse, antisocial personality, and criminality (McCord & McCord, 1960; Kandel, Simcha-Fagan, & Davies, 1986; Loeber, 1988; Robins, 1966). These problems also have been found to be related to the progression from legal to illicit drugs (Yamaguchi & Kandel, 1984). These earlier findings were replicated by reanalyses of data from the Epidemiological Catchment Area (ECA) Project (Robins & Price, 1991), in which a wide range of adult psychopathology was predicted by childhood conduct problems. Antisocial personality, drug abuse, and alcohol were best predicted by conduct problems, and conduct problems had a weaker impact on other disorders. Furthermore, the severity of conduct problems also predicted the age of onset of substance abuse and depression (Price, 1991).

Although the correlation of intoxication with aggressiveness and reckless and impulsive behaviors is common knowledge, evidence appears scanty to support a biological basis for a developmental link between childhood behaviors and later substance use and abuse in humans. Perhaps better articulated findings can be seen in animal studies on aggression and alcohol. Although stress increases alcohol consumption in mice, evidence that aggressive mice drink more alcohol does not appear to exist. In primates, it appears that use of alcohol by aggressive primates enhances aggressive behaviors (Hilakivi-Clarke & Lister, 1992; Kudryavtseva, Madorskaya, &
Bakshtanovskaya, 1991; Miczek, Weerts, & DeBold, 1993). Limited in generality, the biological basis for the link appears to suggest a common cause, perhaps through inheritance, rather than an intervening one.

**Risk and Protective Factors as Modifiers and Moderators of the Developmental Paths**

**Childhood Risk and Protective Factors**

A large body of Western literature exists that attempts to identify risk and protective factors of childhood temperament, aggression, and behavior problems and disorders (Loeber & Stouthamer-Loeber, 1986; Buka & Earls, 1993; Earls & Jung, 1987; Robins, 1991; Snyder & Patterson, 1987). Early characteristics of children that predict the development of conduct problems and aggressive behaviors include male gender, history of prenatal perinatal complications, minor physical anomalies, temperamental difficulties, lack of attachment to caretaker, attention deficit hyperactivity, impulsiveness, low IQ (especially in low verbal ability), poor motor skill development, developmental delays, and failure in schools. Also highly predictive are family characteristics, including a history of parental criminality and alcoholism, parental discord, child abuse/neglect, parental absence due to divorce or separation, and large family size. Parental practices such as lack of supervision, prenatal rejection, lack of involvement, and erratic and severe disciplines are found to be the most powerful predictors of later delinquency. Good evidence exists that these individual and family risk factors are influenced by socialization practices exhibited in larger contexts, such as in daycare and school, social class, and culture. Less is known about specific community and neighborhood contexts within which micro-environmental factors operate.

**Multiple-Pathway Developmental Model of Psychopathology and Substance Abuse**

We earlier developed a heuristic model integrating developmental psychopathology and
environmental factors (Price, Wada, & Murray, 1995). This model, which is intentionally broad and is not intended to express causal hypotheses, derived from our review of a number of contemporary findings in this area (Robins & Price, 1991; Brook, Nomura, & Cohen, 1989; Chen & Kandel, 1995; Dolan et al., 1992; Earls & Jung, 1987; Glants & Pickens, 1992; Hawkins & Catalano, 1992; Johnson & Pandina, 1993; Kandel, Simcha-Fagan, & Davies, 1986; Loeber, 1988; Petraitis & Flay, 1995).

— Figure 2.1. About Here —

In this heuristic model, a developmental path in the intrapersonal domain focuses on maladaptive or psychopathological rather than normal development. Based on existing literature, developmental links are assumed from early temperament in infancy and preschool years to behavioral problems in mid to late adolescence, to subsequent antisocial personality. Alcohol abuse, drug abuse, and antisocial personality are strongly correlated (Regier et al., 1990) but the causal relationships among the three are inconclusively defined. For example, a substantial proportion of adult antisocials do not have a childhood history of conduct problems. Their symptoms appear largely to have resulted from substance abuse problems (Brooner, Schmidt, Felch, & Bigelow, 1992; Cottler, Price, Compton, & Mager, 1994).

A conceptual distinction is made between intrapersonal and environmental etiological factors (intrapersonal and social domains in Figure 2.1) for development of substance abuse and adult psychopathology, although some factors fall into a gray area. Important environmental factors such as socialization, family, peer effect, and societal norms and customs are considered as environmental moderators in this conceptual model.

Cross-Cultural Applicability of the Multiple-Pathway Developmental Model
The above model was conceived primarily from American research. The postulates that developmental paths exist from early temperament to childhood behavioral problems to subsequent substance abuse and antisocial personality may not apply in some groups or societies. Some risk and protective factors may differ or be absent in some segments of a society, or weaker in one gender. We shall briefly review the cross-cultural findings that have accumulated in the area of childhood problems and pathology and their links to substance use and abuse. International research is examined because of the higher contrasts of differences in environmental factors. A considerable degree of inter-racial/ethnic reproduction in the U.S. population (Hwang, Saenz, & Aguirre, 1997; Lee & Fernandez, 1998; U.S. Dept. of Commerce, 1999; Tafoya, 2000) makes it more difficult to discern the differences in environmental factors when differences in childhood problems and substance use are found, because population homogeneity hardly can be assumed.

Childhood Behaviors

Aside from the numerous studies that exist in the United States, a majority of classic epidemiologic studies in childhood behavioral problems have been conducted within other Western societies, such as the United Kingdom (Davie, Butler, & Goldstein, 1972; Rutter, Cox, Tupling, Berger, & Yule, 1975; Rutter, Tizard, & Whitmore, 1970), Denmark (Kastrup, 1976) Australia (Connell, Irvine, & Rodney, 1982), and New Zealand (McGee, Silva, & Williams, 1984). Cross-cultural studies that employ similar ascertainment and assessment are rarer, but they do not highlight striking cultural differences. For example, Achenbach (Achenbach, Verhulst, Baron, & Althaus, 1987) reported similarities in the distribution of scores from the Behavior Checklist between clinically referred American and Dutch aged 6 to 11 and 12 to 16 years. A Dutch adoption study in a sample of early adolescents internationally adopted from Korea, Columbia, and other Asian and
European countries did not detect a large impact of ethnic differences on shared environmental influences (Van den Oord, Boomsma, & Verhulst, 1994).

One of the most comprehensive cross-cultural studies of behavioral problems to date in Asian societies was conducted by a World Health Organization (WHO) collaborative study group (Matsuura et al., 1989; Matsuura et al., 1993). In this study, the prevalence of Japanese children with deviant scores using Rutter's teacher rating scale (Rutter, 1967) was 3.9% and the rate using the parent scale was 12.0%. This prevalence compared to the teacher and parent ratings of 8.3% and 7.0% in China and of 14.1% and 19.1% in South Korea. The teacher rating in Japan was lower than those in eight other studies conducted earlier in the United Kingdom, Uganda, Italy, Mauritius, New Zealand, and China also using Rutter's scale, where scores ranged from 7.9% to 23.3%.

Several other differences were found among Japan, China, and South Korea. The prevalence of deviance was lower at school and at home among older children in Japan. No such difference between older and younger children were found in China or Korea. The prevalence of deviance in one-parent families was higher in China and South Korea, but statistically significant differences were not found in Japan. Finally, deviance at school and school achievement were correlated in Japan and China, but not in South Korea. These differences indicate there is considerable variation in patterns of behavior problems and their correlates even within Asian societies. Thus, it appears the evidence is conclusive regarding cross-cultural variations of childhood conduct and behavioral problems.

**Developmental Link to Substance Use and Abuse**

Reports from epidemiologic studies outside the United States suggest that a developmental link is not unique to this country. A report from Ontario, Canada (Boyle et al., 1992) confirmed the
independent contribution of conduct disorder to predict marijuana use. Early problem behaviors distinguished heroin addicts from controls in Pakistan (Gillis, Tareen, Chaudhry, & Haider, 1994). Japanese epidemiologic studies suggest that solvent abusers in Japan, who often become methamphetamine abusers later (Fukui, Wada, & Iyo, 1994), have a high likelihood of association with juvenile delinquents even before their first solvent use, and have an increased association with criminals after their first use (Wada & Fukui, 1994). Similar associations are reported on behavioral correlates of adolescent inhalant abuse from other Asian countries, elsewhere in the Pacific Region (Kin & Navaratnam, 1995) and South America (Baldivieso, 1995). As shown in later chapters and reported elsewhere, the results of our analyses also confirmed associations between childhood problems and alcohol abuse (Price, Risk, Zoccolillo, & Spitznagel, 1999) drug abuse, and antisocial personality (Price et al., 1999) among the five societies of the United States, Canada, New Zealand, South Korea, and Taiwan. Therefore, the issue is not so much the existence of such an association but its strength, which is presumably affected by the strengths of environmental risks and protective factors, as well as potential genetic differences.

Summary

In this chapter, we provided some background conceptualization that led to our subsequent research examining cross-societal variations in the developmental pathways from childhood conduct and behavioral problems to outcomes in psychopathology and substance abuse. Our model, derived from reviews of numerous findings based on the assumptions that the developmental process has discernible stages across individuals, and that the course is mediated or moderated in response to influences of environmental factors or as a result of stage-specific differential gene expressions. We reviewed the evidence from the Western literature of the existence of a childhood form of behavioral
and conduct problems, their etiology, their link to substance abuse, environmental risk and protective factors. Available knowledge on cross-cultural applicability of these concepts and pathways was also examined. We conclude that it is likely that some associations are applicable to most societies, but, depending on the nature and strengths of risk and protective factors, the magnitude of these associations can differ considerably across societies. In the next chapter, we examine some conceptual and methodological issues that surround the cross-cultural approach we employ in this monograph. These issues will need to be considered when interpreting the results presented in subsequent chapters.
Figure 2.1. Multiple Pathways of Developmental Psychopathology and Substance Abuse, and Risk and Protective Factors as Mediating and Moderating Pathways

- **SOCIAL DOMAIN**
  - Friends' experimentation
  - Low socialization
  - Familial substance abuse
  - Family disruption
  - Early experimentation
  - Poor experimentation
  - Deviant friends
  - Lack of prosocial role models
  - Economic disadvantage
  - Dropping out of school

- **INTRAPERSONAL DOMAIN**
  - Genetic/biologic traits
  - Aggression
  - Impulsivity
  - Gender
  - Sensation-seeking personality
  - Emotional well-being
  - Family stability
  - Emotional well-being
  - Belief in social norms

- **Behavioral Problems**
  - Early Temperament
  - Drug Abuse

- **Antisocial Personality**
  - Alcohol Abuse

- **Drug Abuse**

Chapter 3.

Conceptual and Methodological Issues
in Cross-Cultural Research

Within the lifetimes of children now being born, the combined effects of immigration, differences in childbearing and mortality rates, and variations in age distribution will result in a U.S. population in which persons of non-European backgrounds will comprise the majority (Day, 1993) Applying U.S. Census Bureau projections, Hispanics will represent nearly one-fourth of the U.S. population by 2050, compared to 9% in 1990. The African American population will increase from about 12% to over 14% by 2050. The proportion of Asian Americans and Pacific Islanders will more than triple, increasing from less than 3% to 10% of the U.S. population.

America’s shifting ethnic profiles will affect specific regions differently. By 2020, Americans of non-European ancestry are projected to make up 65% of Californians, 57% of Texans, 51% of Floridians, and 45% of New Yorkers (Campbell, 1994) Such estimates are tentative; however, trends are firmly set and appear unlikely to alter significantly. Increased understanding of the workings of other cultures is becoming an internal concern for the United States.

Racial/ethnic groups, regions, or societies in certain instances can provide a natural “case-control” design where identification of risk factors that led to the appearance of a disease in known cases depends on the availability of “controls” with similar background characteristics without the presence of that disease in question. Past successful research in ethnic migration studies of

cardiovascular disease (Worth, Kato, Rhoads, Kagan, & Syme, 1975) rested on the understanding that environmental protective factors differentially impacted individuals of the same ethnicity who were at different stages of acculturation to Western lifestyle (e.g., diet, exercise). The historically low prevalence of drug use and abuse in most areas of the Asian Continents makes studying multi-generations of Asian immigrants and their U.S. born descendants particularly suitable populations to study sociocultural protective factors and their decay over time (Price, Wada, & Murray, 1995). From the developmental psychopathology approach, for example, if protective factors in infancy through early childhood most effectively inhibit the occurrence of childhood behavioral problems, this risk factor for substance use would be less prevalent among those adolescent groups with lower levels of substance use. On the other hand, if protective factors exert their influences most effectively in early to late adolescence, childhood and behavioral problems should be as common in this group as in the group with higher substance use, but other indicators such as peer influence and family cohesion should be more variant according to the variation of substance use.

Studying the behaviors of individuals who reside in their native lands as counterparts of those who migrated to the United States over time should yield findings better contrasted than those based on comparisons U.S.-born ethnic groups and the majority racial groups. In theory, once such ethnic-specific protective factors are identified and their significance is confirmed from international research a prevention program can be designed by enhancing the identified protective factors for the groups in the United States where substance abuse is endemic. Future prevention and intervention of substance abuse for growing minorities in the United States may require strategies that are more culturally relevant to the unique traditions of their social and cultural structure, enabled by finding their unique traditional protective factors. Such needs for culturally sensitive prevention and
intervention programs will grow larger (Edwards & MacMillan, 1990) corresponding to the shift in
the U.S. population in the near future.

Thus, the value of international/cross-cultural research can be appreciated; nonetheless, a
number of conceptual and methodological challenges exist for such a study to yield informative
results. We introduce two opposing ideological and methodological positions to highlight some of
these challenges and how the subsequent research fits into the traditions of international/cross-
cultural research.

Cross-Cultural and International Epidemiology

Comparative epidemiologic studies in psychiatric problems and substance abuse have existed
for some time. However, the appearance of cross-cultural studies, where multiple cultures are
simultaneously and systematically compared as presented in this monograph, are relatively new
owing to certain requirements needed to assure comparability of data across societies. The new
developments, however, have run the risk of inadequate attention to validity issues at the cost of
uniform comparability. We describe the two opposing approaches to illustrate the advantages and
disadvantages of the approach we have taken and how we have attempted to maximize the yield of
our study.

Universalist Approach

The universalist approach is wedded to the medical model and to Western psychiatric and
substance abuse nosologies, which views cultural differences in psychiatric and substance abuse
disorders as reflecting differences in content, but not differences in form. This position is
exemplified by the World Health Organization's cross-national study of schizophrenia (World Health
Organization, 1973; Sartorius et al., 1986) According to this approach, establishing and refining a
common language that will ensure a useful degree of comparability between studies is considered as an essential methodological issue, because psychiatric epidemiologic studies lack physical or biochemical indices (Wing, 1985).

In the past two decades, a spurt of interest in diagnostic classification for psychiatric and substance use disorders resulted in the development of many highly structured and highly standardized assessment interviews, which have been translated into many languages (World Health Organization, 1994). The use of a highly structured instrument across cultures enables the direct comparison of results, although differences in training, research acceptability, and cultural differences in response patterns may still contribute to the observed differences in symptoms. Among the many studies with the universalist approach, studies on cross-cultural differences and trends in alcoholism (Helzer & Canino, 1992) and depression (Cross-National Collaborative Group, 1992) utilized existing cross-cultural datasets that employed standardized assessment and general-population sampling. The design of the study carried out in this monograph is similar to these earlier studies: Datasets analyzed share many methodological features in data collection and core assessments.

**Culturalist Approach**

Comparisons across cultures would still be limited even with the highest level of methodological rigor applied, if underlying constructs are not universal across societies. Cultural anthropologists have argued that Western psychiatry commits a "categorical fallacy" by applying a concept derived from Western culture to a phenomenon that originated in a drastically different culture (Kleinman, 1987) Kleinman referred to the case of a South Asian psychiatrist who applied "semen loss syndrome," an indigenous Ayurvedic disease category, to North Americans
He challenged that this example of categorical fallacy is no different from the kind of categorical fallacy commonly committed by Western psychiatry when Western categories are imposed on societies for which they lack coherence and validity.

Another pertinent issue relates to the sensitivity of an assessment derived from one culture when it is used for another culture. It can be argued that such an application identifies only those whose behaviors are common across cultures, thus leading to an exaggerated degree of universality of behaviors across cultures. Translation of language and measures in cross-cultural research is essential. But there are several problems in achieving equivalence through translation. Flaherty (Flaherty et al., 1988), for example, lists five kinds of cross-cultural equivalence: content equivalence, that is, content of a question needs to have some relevance for the culture; semantic equivalence, meaning that words must have the same meaning; technical equivalence, that is, the question needs to be applicable to a nonliterate culture; criterion equivalence, that is, questions should measure responses to similar items that relate to the same normative concept; and, finally, conceptual equivalence, that is, responses to the questions relate to a theoretical construct within the culture. Achieving cross-cultural validity in all these criteria of equivalences may not be feasible from the current method of translation and back-translation. The culturalists suggest that more valid results may be obtained by developing a culturally specific instrument that is conceptually equivalent to, but not a translation of, an existing instrument (Manson & Shore, 1981).

**Comparability and Validity in Cross-Cultural Research**

Polemic arguments by both the universalists and culturalists are extreme. At one extreme are clear cases of categorical fallacy where the constructs in comparison are of different entities, although observed measures seem comparable without in-depth knowledge of the two groups (Price,
Pope, Green, & Kinnevy, 2000). At the other are studies in which measures are limited only to those present across multiple groups; therefore, such measures are good indicators of the construct only in one group. In this situation, unique cultural aspects of the other group would not be observed. Significant results tend to gravitate toward establishing cross-cultural similarities. There is cross-cultural comparability, yet results are biased.

Between the two extremes, there exists a situation in which, while underlying constructs are conceptually equivalent, measures expressed do not overlap perfectly because of cultural differences (Price, 1997). Semantic comparability is compromised and the validity of the concept cannot be assured statistically. Nevertheless, results may still be more useful theoretically and be more informative to the public than in either the universalist or culturalist situations, because there is an agreement that the construct exists across groups and that we have knowledge of how expressions are similar or different. Unfortunately, we don’t have a splendid method for testing the construct validity of this approach. If one were to accept this position, the notion of current scientific standards of validity may need reconsideration.

The basic orientation of the cross-national research described in this monograph falls in the tradition of the universalist approach with some modifications. The universalist approach does offer a few important advantages. Uniform assessment allows comparisons that are not due to differences in questions; formal statistical testing for cross-cultural hypotheses can be carried out; and results are highly generalizable. We are also sensitive to the issue of culturally specific indicators of childhood problems, as well as adult antisocial personality and substance abuse. Once uniform assessment is applied, most unique indicators are already omitted. Our study is limited to commonly
assessed measures. Nonetheless, limited to the available measures, we will examine the commonality of indicators across societies in the chapters relating to patterns of endorsement (Chapter 6 through 8). Statistical problems when uncommon indicators are included in the analysis are described in Appendix B as well. Our hope is that once the basic premises that motivated this study are confirmed, studies of moderating and mediating factors should use more culturally specific measures (thus instruments). Those tasks, however, are left for the future.

Summary

This chapter served to state the orientation of the cross-national research that will be presented in the subsequent chapters. Two polemic existing positions, the universalist approach and the culturalist approach, were introduced. Although we are sensitive to the methodological and conceptual limitations of the universalist approach, we have adopted this approach because the basic objective is to show some universal patterns of developmental psychopathology and substance abuse and societal deviations from the expected pathways. We will provide results of examinations of commonality and differences in endorsement of measures across societies; however, such examinations will have to be limited to available measures assessed across societies.
Figure 3.1. Comparability and Validity of Cross-Cultural Research: Three Illustrative Cases

Chapter 4.

Cross-National Database

In the previous chapters, we introduced two broad conceptual frameworks, one from the perspective of developmental psychopathology and the other from the perspective of cross-cultural research. Based on these conceptualizations, the scope of the empirical research undertaken for this monograph was considered as a preamble of more elaborate longitudinal studies involving multiple countries. The aims of the current research therefore were relatively narrowly defined. Across societies with varying levels of substance use, we wanted to examine variations in conduct and behavioral syndrome, and we wanted to assess if the variations of transitions to substance abuse and antisocial personality would be observed in a fashion that would lend to interpretation of a differential impact of risk and protective factors.

Despite these narrowly defined objectives, eligible databases had to meet several requirements: Outcome substance use measures showed some differences; measures of both conduct syndrome and substance use and abuse were relatively uniformly assessed; sampling methods are similar across datasets; and, preferably, general-population surveys were used so that results would be generalizable as much as possible. Fortunately, several surveys existed that met these criteria: The St. Louis portion of the multisite Epidemiological Catchment Area (ECA) Program in the United States (Robins & Regier, 1991); the Edmonton Survey of Psychiatric Disorders in Canada (Orn, Newman, & Bland, 1988); the Christchurch Psychiatry Epidemiology Study in New Zealand (Wells,

Bushnell, Hornblow, Joyce, & Oakley-Browne, 1989); the Taiwan Psychiatric Epidemiologic Project (Taiwan Department of Health, 1986); and the Epidemiological Study of Mental Disorders in South Korea (Lee, 1992). All of these studies were conducted independently by investigators in their native lands in the early to mid 1980s. The four surveys outside the United States are highly comparable to the U.S. dataset (Eaton & Kessler, 1985), due mainly to similar ascertainment and assessment methods.

A short digression to a history of psychiatric epidemiology during 1980's to early 1990's again may be helpful in understanding why such surveys became available from several regions of the world (Price, Mookherjee, Shea, & Reichmann, 1994). In the late 1970's, major efforts were initiated by the U.S. National Institutes of Mental Health under the Carter Administration to improve the estimates of major adult psychiatric disorders to assess the degree of mental health and substance abuse services utilization (The President's Commission on Mental Health, 1978). Among the series of initiatives undertaken, one was to improve the nosological system used by U.S. researchers, known as the Diagnostic and Statistical Manual of Mental Disorders. The result was the first systematic symptom-based classification system, Diagnostic and Statistical Manual of Mental Disorders, Third Edition (DSM-III) (American Psychiatric Association, 1980), which became the bible for psychiatric classification in the following decade. Working through the drafts of DSM-III, a standardized psychiatric assessment named the Diagnostic Interview Schedule - Version Three (DIS-III) (Robins, Helzer, Croughan, Williams, & Spitzer, 1981) was developed to launch what was then the largest general-population psychiatric epidemiologic survey in the history of the United States, known as the ECA Project (Regier et al., 1984).

The golden age of American psychiatric epidemiology exemplified by the ECA had a
tremendous impact internationally. A number of investigators worldwide wished to apply the ECA methodologies to examine the extent and the nature of psychiatric disorders in their native countries. Although investigators had different substantive interests, the ECA methodologies were conscientiously followed, including uniform assessment across individuals using translated versions of the DIS, and the application of complex survey sampling methods in the general population. All datasets obtained for the research reported in this monograph were conducted during this historical expansion of psychiatric epidemiology to worldwide.

Before long, the wealth of information and the unique opportunity to address cross-cultural differences in psychiatric disorders caught attention of the investigators who were involved in the ECA project. For example, Helzer and his collaborators examined cross-cultural differences and trends in alcoholism using datasets overlapping those used in our research (Helzer & Canino, 1992); Weissman and her colleagues used a wider range of existing surveys that employed standardized assessment and general-population sampling to examine cross-cultural differences in depression (Cross-National Collaborative Group, 1992). The design of the study carried out in this monograph is similar to these earlier studies: Multiple international sites with uniform core assessments were intentionally chosen to minimize differences due to different ways in which measures were assessed. Furthermore, general population studies were chosen so that the results would be reasonably generalizable to the population.

A few unique features in our research extend these previous efforts. The first feature is our attempt to avoid imposing the existing nosological system that may reflect Western conceptualizations too stringently. Thus, instead of using the DSM-III, we employed empirically obtained discrete classes as a way of characterizing the patterns of symptom expression. The second
feature relates to the ability to test cross-cultural hypotheses by pooling all datasets together. Such an attempt helps make more precise statements about cross-cultural differences and similarities than was possible in previous efforts where comparisons were made in a descriptive fashion. In this chapter, we describe the populations, sampling methods, and sample characteristics of the five studies, and provide describe characteristics of the measures used in the subsequent chapters.

**Population Description and Sampling Methods**

The five survey sites are located in three broad regions around the Pacific: two sites from North America, one site from Oceania, and two sites from East Asia. We shall briefly describe the general characteristics of these places and their populations, selection of the catchment areas, and sampling methods used.

**United States (St. Louis, Missouri)**

St. Louis is the largest city in Missouri, located on the Mississippi River just south of its confluence with the Missouri River. St. Louis forms the core of a metropolitan area that ranked 17th in population in the United States at the time of the original study. The city proper lost more than half of its population in the last 40 years, as surrounding suburbs grew. Nevertheless, The City of St. Louis continued to be the 14th most densely populated city in the country, according to the last census. In the 1980's, about half the city's population was African American, compared to 17% in the metropolitan area as a whole. The city maintained relatively high unemployment rates around 10% despite recent improvements in the economy of the region when the study was conducted.

**Catchment areas:** Three federally defined community mental health catchment areas were selected within the inner city of St. Louis, an inner suburb, and a three-county small town and rural area on the outskirts of the metropolitan area.
Sampling method: A five-stage stratified cluster probability design was used. Census enumeration districts were selected for each of the three areas. Districts with large African American populations were oversampled. Altogether 150 strata with two clusters each were used to construct the general-population sample.

— Figure 4.1. (a) About Here —

Canada (Edmonton, Alberta)

Reflecting the extreme northern location of much of its area, Canada as the second largest country in the world had a population of just over 28 million, and a population density one-tenth that of the United States in the 1980’s. Edmonton, capital of the western Province of Alberta, was the fifth largest city and the northernmost population center in Canada. Canada’s population as a whole was overwhelmingly of European descent (40% British, 27% French, 20% other European), with 1.5% being native American or Eskimo. Alberta's population likewise was almost exclusively white, although without a sizeable French representation. Canadians as a whole enjoy a high standard of living, with a 99% literacy rate. The historical importance of agriculture to the economy of Edmonton and the rest of Alberta was challenged after World War II, and especially in the 1970s, by the rapid development of gas and oil deposits. The population increased rapidly at this time. However, the economy after 1982 experienced a downturn, with increased unemployment.

Catchment area: The City of Edmonton proper was selected for the sample, excluding suburban and neighboring rural areas.

Sampling method: A two-stage design was used, with households systematically sampled from a list of residential addresses and one household member then chosen through a respondent selection grid. Hospitals and nursing homes were excluded; a separate institutional sample taken at a later date.
is not contained within the present dataset (Orn, Newman, & Bland, 1988).

**New Zealand (Christchurch)**

New Zealand comprises an island chain about 1,400 miles southeast of Australia. Its two main islands combined are about the size of Colorado. The 3.4 million New Zealanders are nearly 90% European (mostly British) and about 9% Polynesian (mostly Maori). The population is 85% urban. Christchurch is located on the northeast coast of the South Island, and with a population of over 300,000 is the country's second largest city. The proportion of non-European citizens in the population was smaller in Christchurch than in the nation as a whole in the 1980's. Two-thirds of New Zealand's labor force was in services and government. New Zealand is a leading livestock and timber producer with a high standard of living and a 99% literacy rate. A former British colony, organized European settlement did not begin until after 1840. A progressive political tradition, with state ownership or control of many industries, extends back to the nineteenth century.

*Catchment area:* The sampling area was Christchurch's central city, neighboring suburban boroughs, and semirural areas along the margin of the city.

*Sampling method:* A three-stage sampling design was used. Long-term institutional care facilities were excluded but employee quarters and other group-living situations were included. A resident between the ages of 18 and 64 in two out of every three dwellings was eligible. For every third household only a woman aged 18 to 44 years was eligible, to oversample cases of eating disorders and depression (Wells, Bushnell, Hornblow, Joyce, & Oakley-Browne, 1989).

— Figure 4.1. (b) About Here —

**South Korea**

Its ethnically homogeneous population of about 45 million occupies the southern half of the
Korean peninsula located in the same latitudes as most of Japan. Seoul, the capital, is the fourth most populous city in the world, and the country's population was 74% urban at the time of the original study. Despite increasing industrialization, a mountainous terrain has contributed to the retention of more traditional lifestyles in isolated areas. One-fifth of the work force was agricultural in the 1980's. Literacy is at 96%. South Korea's separation from North Korea in 1945 was preceded by 35 years of Japanese occupation and followed by war and continuing tensions with the North.

*Catchment areas:* To obtain a nationwide sample, two component samples were selected: one representing the urban population was drawn from Seoul; and the other from scattered rural locations over the country.

*Sampling method:* A two-stage cluster sampling method was used for each sample. Using the 1980 census data, large geographical administrative units were chosen as the primary sampling units (PSUs) using a probability proportionate to size (PPS) methodology. Five secondary sampling units (SSUs), 20 to 30 times smaller than PSUs, were drawn from each PSU by systematic random fashion. After screening out ineligible households, 2,645 households were selected randomly. Everyone in the household was eligible for interview selection (Lee, 1992).

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**Taiwan**

A densely populated island the size of Connecticut and New Hampshire combined, Taiwan lies 100 miles east of China. Its population was about 20.3 million in the 1980's and is highly urbanized (75%), with native Taiwanese (largely descendants of Chinese immigrants from the 17th century) accounting for 84% of the population. Chinese Nationalist immigrants and families, arriving in 1949, account for about 14% of the population. A very small proportion of the population is non-Chinese.
Taiwanese, with ancestry predating Chinese influxes. The island was ruled by Japan between 1895 and 1945. Despite increasing industrialization, however, 16% of the labor force remained in agriculture into the 1980's. Literacy is at 90%. Although Taiwan has one of the world's strongest economies, political isolation as a result of its severance from mainland China has been a characteristic of Taiwan's situation for some time.

**Catchment areas**: The entire metropolitan area of Taipei, two townships, and six rural counties comprised the sampling frame. One of the selected townships, Su-Lin, is close to Taipei, and had experienced rapid population growth at the time of the sampling. The other, Tsau-Tung, is farther from Taipei and had more gradual growth. Of the counties selected, two were in the north, two in the central region, and two in the south of Taiwan. They were chosen to provide the three rural village-types present in Taiwan; farming, fishing, and both combined.

**Sampling method**: A multistaged, stratified cluster probability design was used. Respondents were selected from rosters including name, age, sex, marital status, education, occupation, place of birth, and current addresses for all adults. Although systematic sampling was used, investigators of the original study generally tended to estimate the prevalence rates in Taiwan as though the sample was obtained randomly (Compton et al., 1991).

**Other Surveys Considered**

A few more surveys that were potentially available for the current research were not chosen because of a lack of necessary measures. A survey carried out in Puerto Rico (Canino, Burnam, & Caetano, 1992) was not included because antisocial personality and drug abuse and dependence were not assessed in the survey. A dataset from Shanghai, China, could not used because childhood conduct symptoms were not included in the Chinese version of the DIS due to the Chinese
researchers' doubt about ensuring cultural appropriateness of these symptoms in China without extensive modifications (Wang et al., 1992). There are also four other U.S. sites in the ECA Core database. Because of the authors’ familiarity (Price, Robins, Helzer, & Cottler, 1998), however, the St. Louis ECA was chosen.

Sample Description

The sample characteristics are shown in Table 4.1, including the target population size, year of data collection, the sample size, completion rate, and unweighted distributions of age, sex, and race. Target populations ranged from 181,000 to 13 million. With the interview response rates ranging from 70% to 82%, resulting sample sizes ranged from approximately 1,500 to 11,000, large enough to assess symptoms of rare occurrence. Respondents were all 18 years of age or older. With proper weights applied, women comprise about 50 percent of the samples. In all societies, distributions of the samples' demographic characteristics were representative of the compositions of the target populations, including racial or ethnic minorities. Unweighted distributions show that blacks composed 39% of the St. Louis ECA sample, due to the site's oversampling scheme. The population of Taiwan was almost all Asians of Chinese descent: 83% were native Taiwaneses (descendants of early Chinese settlers), 14% mainland Chinese and 2% aborigines. Korea's ethnic distributions were not available, but Koreans were presumed to constitute the entire sample. In New Zealand, 96% were white and 2% were Maoris.

— Table 4.1. About Here —

Measures

The surveys of the five international sites all used the DIS-III (See Appendix C for the pertinent questions applied for our analyses from the DIS III-A, used in the St. Louis site.). Taiwan and South
Korea used translated versions. In South Korea, DIS-IIIK (Lee, 1992) was developed in a fashion similar to the development of the Spanish version (Karno, Burnam, Escobar, Hough, & Eaton, 1983). The DIS-CM-II was developed in Taiwan to correspond to the DIS-III with modifications of the items to improve an earlier Chinese version which had poor inter-rater reliability (Hwu, Yeh, Chang, Chen, & Chen, 1983). Validity and reliability studies were performed by the investigators of the respective two sites.

**Conduct Problems**

Childhood conduct symptoms, applicable for ages younger than 15 years, are age-specific expressions of nonconformity with social norms, both through child’s behaviors themselves and through societal responses to those behaviors. In the DIS-III, conduct problems were assessed as part of the section assessing adult antisocial personality disorder. The 12 questions included behaviors about truancy, expulsion/suspension from school, arrest or being sent to juvenile court, running away, repeated lying, early sexual relations, early use of alcohol or drugs, stealing, vandalism, poor grade or underachievement, trouble at school, and trouble with starting fights (See Q196 to Q209 in Appendix C.).

**Outcome Measures**

The primary outcome measures included antisocial personality (ASP) behavior questions, and use of psychoactive substances and symptom and diagnostic measures of substance use disorders. Adult ASP symptoms included work problems, parental neglect, legal problems, marital or other relationship problems, violence, debts, vagrancy, frequent lying and traffic offenses (See Q214-Q231 in Appendix C).

In the alcohol and drug sections of the DIS-III, questions were asked about use and problems
related to seven classes of psychoactive substances. The questions allowed assessment of all symptoms of major classes of substances included in the DSM-III criteria as well as diagnoses of the disorders. Alcohol questions were more extensive than those available for drug use symptoms. Three questions were chosen for alcohol use. Eight symptom measures were constructed from a total of 24 questions, including dependence, large quantity, withdrawal, pathological drinking, control, health problems, social problems, and legal problems. The construction of these measures followed our earlier analyses of St. Louis ECA, carried out to examine symptom clustering patterns using the structural equation modeling (Price, Robins, Helzer, & Cottler, 1998). The symptom criterion measures were decided also in part based on the examination of symptom prevalence, and they are slightly different from the DSM-III criteria symptoms for dependence or abuse. More detail is presented in Chapter 7.

Use of illicit drugs and symptoms of drug use disorders were available for marijuana, stimulants, sedatives, cocaine, opioids, and hallucinogens. Coverage of measures, however, was less extensive than for alcohol use and symptoms. Two use questions were used; one question was available for each of the eight criterion symptoms of the DSM-III criteria for drug dependence or abuse. There was a considerable overlap between the measures for alcohol symptoms and those for drug symptoms; however, they were not identical. Because of low prevalence in the non-Western societies, Chapter 8 reports results based on all illicit drug classes combined.

**Modifications of Sample Inclusion and Measures**

In the following chapters, the institutional sample in the U.S. site (St. Louis), and those of 65 years old or over in the United States (St. Louis), Canada (Edmonton), Taiwan, and South Korea were eliminated to maintain maximum sample comparability. Also excluded were those without
gender information, and those observations with missing information on the first question of ever drinking. In addition, those missing nine or more childhood symptom criteria and six or more alcohol problem criteria were omitted from subsequent analyses.

The question regrading early sexual relations was omitted from analyses of the childhood form of antisocial personality, because the question was not computed from the Canada dataset and was not asked in the South Korean survey. Among the symptoms of adult antisocial personality, negligent parenting and debts were not used in the subsequent analyses: negligent parenting was not used because of differences in parenting habits between Taiwan and other sites. The symptom of debt was not used because of ascertainment differences between the Canada survey and surveys from the United States, New Zealand, and Taiwan, and its missing entirely in the South Korea survey. With these modifications, more detail of the childhood symptoms is described in Chapter 6, and transitions to outcome behaviors, adult antisocial personality, alcoholism, and drug abuse are presented in Chapters 6 through 8.

**Descriptive Comparison of the Five International Sites**

In the subsequent chapters, these use or symptom measures are considered as indicators of underlying constructs: childhood and adult forms of antisocial personality, alcoholism, and drug abuse. Before we move to these analyses, a look at descriptive properties of these indicators may be useful. Distributions of the conduct problem measures are shown in Table 4.2, and selected measures of outcome variables are shown in Table 4.3. The dimensional measures are sums of all symptoms or problems, thus the relative importance of each indicator is not taken into account. However, such dimensional measures are convenient in assessing some differences across five sites without introducing advanced statistical estimation.
The mean number of conduct problems from the sum of 12 available symptoms shown in Table 4.2 already indicate some major gender differences. The mean number was at least twice as large in males as females across five international sites. Across males and females, the mean number was higher in the United States and Canada, and was much lower in South Korea and Taiwan. New Zealand fell in between, but was closer to the two Western sites than to the two Eastern sites.

As shown in Table 4.3, the prevalence rates of the adult form of antisocial personality disorder, alcohol dependence or abuse, and drug dependence or abuse were similar among residents of the two Western cities of St. Louis and Edmonton. In comparison, prevalence rates were lowest for all three syndromes among residents in Taiwan. Rates of drug dependence were similarly low among residents in South Korea. However, the rate of antisocial personality was more than twice as high as that in Taiwan. Furthermore, the rate of alcohol dependence/abuse was higher (23.2%) in South Korea than in any of the other countries, despite the alcohol use prevalence being much lower than the three Western countries (47.2% in South Korea vs. 76.7% in U.S.A., 79% in Canada and 77.9% in New Zealand) The rates of outcome measures for Christchurch, New Zealand, generally fell in between except for the measures of both alcohol use and dependence or abuse.

These data indicate that the disorders that are found to highly correlate with conduct problems are more prevalent among Western societies than in the two Asian societies. But Korea's high rate of alcoholism and a higher rate of antisocial personality indicate some heterogeneity within the two Asian societies. They are consistent with Dr. Matsuura and colleagues' (Matsuura et al., 1993) findings from the WHO cross-cultural study that behavioral problems are more prevalent in Korea than in China or Japan.
Summary

This chapter introduced five existing general-population epidemiologic surveys that were used to examine cross-national similarities and differences of childhood and adult forms of antisocial personality, alcoholism, and drug abuse. The five societies were the United States (St. Louis), Canada (Edmonton), New Zealand (Christchurch), South Korea, and Taiwan. These surveys were conducted at a unique moment in the history of psychiatric epidemiology. As a consequence, they all utilized almost identical instruments, and applied very similar sampling methods in a general-population framework. A first look at the dimensional and categorical measures of childhood conduct syndrome, the adult form of ASP, alcoholism, and drug abuse indicate that patterns between the two Western societies, the United States and Canada, were similar to each other; patterns between two Eastern societies, South Korea and Taiwan, also were similar to each other; and New Zealand fell in between. However, there are some indications of a degree of heterogeneity between South Korea and Taiwan.
Table 4.1. Dataset and Sample Demographic Characteristics of Epidemiologic Surveys from Five Countries

<table>
<thead>
<tr>
<th>Locale</th>
<th>St. Louis</th>
<th>Edmonton</th>
<th>Christchurch</th>
<th>Seoul, rural areas</th>
<th>Taipei, towns, counties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country</td>
<td>U.S.A.</td>
<td>Canada</td>
<td>New Zealand</td>
<td>South Korea</td>
<td>Taiwan</td>
</tr>
</tbody>
</table>

**Dataset characteristics**

<p>| | | | | | |</p>
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Target population</td>
<td>277,000</td>
<td>394,950</td>
<td>181,000</td>
<td>13,520,908</td>
<td>1,570,590</td>
</tr>
<tr>
<td>Number respondents</td>
<td>3,004</td>
<td>3,258</td>
<td>1,498</td>
<td>5,100</td>
<td>11,004</td>
</tr>
<tr>
<td>Completion rate (%)</td>
<td>79</td>
<td>72</td>
<td>70</td>
<td>82</td>
<td>70</td>
</tr>
</tbody>
</table>

**Sample characteristics**

| Age (%)                |          |          |              |                   |                         |
|                       | 18-24    | 18-24    | 20           | 18                | 23                      |
|                       | 25-44    | 25-44    | 55           | 38                | 45                      |
|                       | 45-64    | 45-64    | 24           | 43\(^b\)          | 25                      |
|                       | 65+      | 65+      |              |                   | 7                       |
| Gender (%)             | Male     | Male     | Male         | Male              | Male                    |
|                       | 40       | 41       | 48           | 48                | 34                      |
|                       | Female   | Female   | Female       | Female            | Female                  |
|                       | 60       | 59       | 52           | 52                | 66                      |
| Race/Ethnicity (%)     | White    | White    | White        | White             | White                   |
|                       | 58       | --       | 96           | --                | --                      |
|                       | Black    | Black    | Black        | Black             | Black                   |
|                       | 39       | --       | --           | --                | --                      |
|                       | Other    | Other    | Other        | Other             | Other                   |
|                       | 3        | --       | 4\(^c\)      | 100               | 100\(^d\)              |

**Note.** Frequencies for age, sex, and race are unweighted. “--” denotes not included in the sample or data not available. Percentages may not add to total because of rounding.

\(^a\)Non-institutionalized household samples only. \(^b\)Includes 65 years old. \(^c\)Includes 2% Maori and 2% others. \(^d\)Includes 83% native Taiwanese, 14% mainland Chinese, and 2% aborigines.
Table 4.2. Distributions of the Dimensional Measures of Childhood Conduct Problems by International Sites and Gender

<table>
<thead>
<tr>
<th>Locale</th>
<th>St. Louis</th>
<th>Edmonton</th>
<th>Christchurch</th>
<th>Seoul, rural areas</th>
<th>Taipei, towns, counties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country</td>
<td>U.S.A.</td>
<td>Canada</td>
<td>New Zealand</td>
<td>South Korea</td>
<td>Taiwan</td>
</tr>
</tbody>
</table>

Male

| Sample size | 970 | 1,207 | 504 | 2,447 | 5,233 |
| Observed range | 0-10 | 0-11 | 0-9 | 0-8 | 0-6 |
| Mean number of problems | 1.42 | 1.45 | 1.26 | 0.52 | 0.35 |
| S.D. | 1.84 | 1.90 | 1.60 | .88 | .77 |

Female

| Sample size | 1,432 | 1,692 | 994 | 2,631 | 4,905 |
| Observed range | 0-10 | 0-8 | 0-9 | 0-4 | 0-6 |
| Mean number of problems | 0.71 | 0.57 | 0.70 | 0.19 | 0.11 |
| S.D. | 1.22 | 1.06 | 1.24 | .48 | .40 |

Note. Results are unweighted. The measure is the sum of 11 symptoms of the DSM-III childhood criterion symptoms of antisocial personality disorder, which are detailed in Chapter 6, Table 6.1. S.D.: standard deviation.
Table 4.3. Distributions of Three Outcomes for Five Sites

<table>
<thead>
<tr>
<th>Locale</th>
<th>St. Louis</th>
<th>Edmonton</th>
<th>Christchurch</th>
<th>Seoul, rural areas</th>
<th>Taipei, towns, counties</th>
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<td>Country</td>
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<td>Canada</td>
<td>New Zealand</td>
<td>South Korea</td>
<td>Taiwan</td>
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</tbody>
</table>

### Adult form of antisocial personality disorder

<table>
<thead>
<tr>
<th></th>
<th>St. Louis</th>
<th>Edmonton</th>
<th>Christchurch</th>
<th>Seoul, rural areas</th>
<th>Taipei, towns, counties</th>
</tr>
</thead>
<tbody>
<tr>
<td>% 3+ symptoms&lt;sup&gt;a&lt;/sup&gt;</td>
<td>18.7</td>
<td>14.4</td>
<td>9.2</td>
<td>3.9</td>
<td>1.4</td>
</tr>
<tr>
<td>Mean number of symptoms</td>
<td>1.39</td>
<td>1.17</td>
<td>0.95</td>
<td>0.55</td>
<td>0.36</td>
</tr>
<tr>
<td>S.D.</td>
<td>1.37</td>
<td>1.37</td>
<td>1.16</td>
<td>.86</td>
<td>.66</td>
</tr>
</tbody>
</table>

### Alcohol

<table>
<thead>
<tr>
<th></th>
<th>St. Louis</th>
<th>Edmonton</th>
<th>Christchurch</th>
<th>Seoul, rural areas</th>
<th>Taipei, towns, counties</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Any use</td>
<td>76.7</td>
<td>79.0</td>
<td>77.9</td>
<td>47.2</td>
<td>34.7</td>
</tr>
<tr>
<td>% Dependence/abuse&lt;sup&gt;b&lt;/sup&gt;</td>
<td>16.8</td>
<td>17.8</td>
<td>15.5</td>
<td>23.3</td>
<td>7.1</td>
</tr>
<tr>
<td>Mean number of symptoms</td>
<td>0.78</td>
<td>0.85</td>
<td>0.72</td>
<td>1.10</td>
<td>0.33</td>
</tr>
<tr>
<td>S.D.</td>
<td>1.58</td>
<td>1.71</td>
<td>1.46</td>
<td>1.95</td>
<td>.92</td>
</tr>
</tbody>
</table>

### Drugs

<table>
<thead>
<tr>
<th></th>
<th>St. Louis</th>
<th>Edmonton</th>
<th>Christchurch</th>
<th>Seoul, rural areas</th>
<th>Taipei, towns, counties</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Any use</td>
<td>35.9</td>
<td>42.2</td>
<td>27.9</td>
<td>5.5</td>
<td>1.5</td>
</tr>
<tr>
<td>% Dependence/abuse&lt;sup&gt;b&lt;/sup&gt;</td>
<td>7.3</td>
<td>6.8</td>
<td>5.4</td>
<td>0.6</td>
<td>0.2</td>
</tr>
<tr>
<td>Mean number of symptoms</td>
<td>0.30</td>
<td>0.30</td>
<td>0.18</td>
<td>0.03</td>
<td>0.01</td>
</tr>
<tr>
<td>S.D.</td>
<td>1.00</td>
<td>1.07</td>
<td>.85</td>
<td>.32</td>
<td>.18</td>
</tr>
</tbody>
</table>

Note. Results are unweighted. Mean number of symptoms is based on the effective sample size.
S.D.: standard deviance.

<sup>a</sup>Percentage of sample meeting DSM-III criteria for three or more of the seven symptoms of the adult form of antisocial personality disorder, which are detailed in Chapter 6, Table 6.1.

<sup>b</sup>Percentage of sample meeting DSM-III criteria for dependence/abuse, unweighted prevalence, which are detailed for alcohol in Chapter 7, Table 7.2, and for drugs in Chapter 8, Table 8.1.
Figure 4.1. Locations of Samples Obtained for Five Surveys

- (a) Canada, Edmonton, United States, St. Louis
- (b) Australia, New Zealand, Christchurch
- (c) South Korea (Seoul & rural locations), Taiwan (Taipei & selected towns/counties)
Chapter 5.

Estimation Methods

The empirical research aims set forth in this monograph, as mentioned earlier, are relatively narrowly defined. Our first aim is to examine the variations in the conduct and behavioral syndrome across societies with varying levels of substance use and abuse. Secondly, we aim to examine variations of transitions to the adult form of antisocial personality and substance abuse that would lend themselves to an interpretation of a differential impact of risk and protective factors. To our knowledge, systematic comparisons of these variations across multiple societies using nearly uniform assessment has not been attempted in the past.

In the previous chapter, we introduced the five general-population survey datasets that allowed pursuing these aims, and described the measures to be used in the analyses to follow. In this chapter, we introduce several analytical strategies we have utilized or considered to achieve our research goals. Perhaps somewhat novel is our attempt to avoid imposing the existing nosological system that may be confined to Western nosological norms. To characterize the patterns of symptom expression, we instead have explored the latent class approach and structural equation modeling. Both are advanced techniques that equate a collection of symptom measures to underlying latent constructs. While the latent class approach considers an underlying construct to be of a discrete nature, structural equation modeling uses a dimensional latent construct.

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Another attempt related to the second aim of the research, but here we wanted to be able to make statements as precise as possible about differences and similarities of transitions from childhood conduct syndrome to “adult” outcomes across societies. For this purpose, we introduce latent transition analysis and a class assignment method combined with a logistic regression approach. The former allows “direct” estimates of transition rates while, in the latter approach, transition rates are estimated from assigning individuals to specific classes. We describe each of these estimation strategies in the remainder of the chapter. This chapter is augmented by more detailed discussions of the latent class approach in Appendix A and structural equation modeling in Appendix B.

**Latent Class Approach**

**Latent Class Analysis (LCA)**

A latent class is a characteristic or trait of an abstract construct that cannot be observed directly. Most abstract characteristics or traits studied in social and behavioral sciences can be considered as characterizations of latent constructs. If an abstract latent construct is believed to be of a discrete nature, that is, that the construct has qualitatively different characteristics or traits within it, then each characteristic or trait is considered as a latent class. Information on latent classes is obtained by studying measures that are believed to be related to the latent classes. In our current study, the latent classes comprise a behavioral construct, such as childhood conduct syndrome, and the observed variables are the individual symptoms, such as truancy and school expulsion.

Latent class analysis (LCA) (Goodman, 1978; McCutcheon, 1987) enables estimations of the probability that any given individual would fall into a specific latent class. Given the class that the individual is in, LCA estimates the probability that the individual would endorse a certain behavior,
e.g., reporting a specific symptom of childhood conduct syndrome. Applications of LCA to psychiatric epidemiologic research have been relatively new (Eaton, McCutcheon, Dryman, & Sorenson, 1989), but its application is increasing rapidly in part because of its ability to derive discrete classes. It is suitable for analyses based on the categorical classification that are typical in psychiatry (Eaves et al., 1993; Hudziak et al., 1998).

The basics of the LCA are schematically presented in Figure 5.1. In this figure, items correspond to the reporting of behaviors or symptoms, such as reporting of truancy and school expulsion, which are indicators of childhood conduct syndrome. Suppose 80% of a sample were considered to belong to Class 1. For a psychiatric syndrome such as childhood conduct syndrome, this class is the “unaffected class,” so that the corresponding endorsement probabilities of indicator items are usually low. On the other hand, Class 2 is only 20% of the sample, and this class is considered as the “affected class.” The endorsement probabilities are higher than those for Class 1.

In this figure, the lines connecting endorsement rates are parallel for Class 1 and Class 2. This indicates that, probabilistically speaking, endorsement rates of Class 1 are lower for all indicators of childhood conduct syndrome than those rates for Class 2; classes therefore are characterized according to the severity of endorsed symptoms. If on the other hand, the lines cross across endorsement items, it indicates the existence of “subtypes.” For example, if shy and aggressive antisocial children exhibit different patterns and this creates two subtypes, those corresponding to the indicators of shy antisocials, such as running away from home, lying, and poor grades, perhaps, have high endorsement rates for Class 1, while indicators of aggressive antisocials, such as arrest, vandalism, and starting fights, would have high endorsement rates for Class 2. In short, LCA was
particularly suitable for our purpose, because classification is derived empirically from symptoms themselves, thus avoiding imposition of a priori nosological criteria such as those in the DSM system. Further details of the basics of LCA, including its mathematical formula and an example using antisocial personality (ASP) measures from the U.S. (St. Louis) site, are presented in Appendix A.

Drug use and drug use problems presented a special case owing to low prevalence. A special class solution for them is discussed in Chapter 8. LCA was applied to select the proper number of classes separately for childhood conduct syndrome, the adult form of ASP, alcohol use, and alcohol abuse by each country and gender. The likelihood ratio $L^2$ (-2 log likelihood) and the Pearson chi-square $\chi^2$ are used to assess the fit of the model as these measures should behave as chi-square distributions with the number of degrees of freedom depending on the number of total possible outcomes and the number of free parameters. For WinLTA, -2 log likelihood is referred to a $G^2$. Selection of the proper number of classes, however, sometimes involves judgment calls, when the combinations of endorsement items are very large, which could result in a large number of “empty cells.” That is, combinations of endorsements that no sample members endorsed. In complicated models, such as the ones we applied, it is well known that a large number of empty cells greatly inflate the degrees of freedom. Thus, we used the nested-model method where a model with n-1 classes is compared to a model with n classes. In this method, the difference of $L^2$'s, the likelihood ratio chi-square values, is in line with the difference in the degrees of freedom (Holt & Macready, 1989).

**Latent Transition Analysis (LTA)**

Latent transition analysis (LTA) (Collins & Wugalter, 1992; Graham, Collins, Wugalter,
Chung, & Hansen, 1991) is considerably expanded from more traditional latent class analysis (McCutcheon, 1987) and allows estimation of latent transition rates ($\hat{o}_{ij}$) from each class (status) at one stage to another class (status) at the next stage. In a latent transition model that has two classes and two time periods, with each time period having three items an observation could endorse, the total log likelihood is expressed as:

$$P(Y) = 3n \ln(\hat{a}_i\hat{n}_{ii1}\hat{n}_{i12}\hat{n}_{i22}\hat{n}_{i32} + \hat{a}_j\hat{n}_{ii1}\hat{n}_{j11}\hat{n}_{j12}\hat{n}_{j13} + \hat{a}_j\hat{n}_{i21}\hat{n}_{j21}\hat{n}_{j22}\hat{n}_{j23})$$

where $\hat{a}_i$ is the probability of starting in class i; $\hat{o}_{ij}$ is the probability of moving from class i to class j; $\hat{n}_{ki}$ is the probability of endorsing or not endorsing (given the observation) item k if the observation is in class i at time t; and n is the number of observations with the given patterns of the endorsement.

Figure 5.2 shows this extension from a basic LCA approach. The figure also shows what each parameter represents. In the following chapters, endorsement rates ($\hat{n}$) are shown in graphs. Our main interest, transition rates ($\hat{o}$), will be shown in the form of transition matrices. These include transition rates from childhood conduct syndrome to the adult form of antisocial personality (Chapter 6), from childhood conduct syndrome to alcohol use to alcoholism (Chapter 7), and childhood conduct syndrome to drug use problems (Chapter 8).

LTA was also utilized to assess cross-societal differences in these transition rates. Although originally designed for an application to repeated measures at multiple points in time (Collins et al., 1994; Graham, Collins, Wugalter, Chung, & Hansen, 1991), we were able to modify LTA to estimate transition rates involving conceptually distinctive constructs. LTA was thus a suitable method to formally test hypotheses on developmental pathways across multiple groups, in our case,
multiple international sites.

*Two-stage and three-stage models:* A simple model, illustrated in Figure 5.2, represents an example of a two-stage model. The number of transition rates estimated are \( l \times m \), where \( l \) and \( m \), respectively, represent the number of classes at \( t_1 \) and \( t_2 \). Two-stage models were applied to estimate transition rates from childhood conduct syndrome to the adult form of ASP, and childhood conduct syndrome to drug use problems.

The LTA model can be further extended to include more than two “time” periods, in our case, more than two developmental constructs. For example, we used a three-stage model in Chapter 7, which is illustrated in Figure 5.3. The model attempts to estimate transition rates from childhood conduct syndrome (childhood ASP) to alcohol use, and transition rates from alcohol use to alcohol abuse all at once. Sufficient variation is necessary in the data. Also, the same sample size must be retained for all periods. Therefore, three-stage modeling was not attempted for childhood conduct syndrome to drug use to drug use problems, because only those who used drugs five times or more were asked about specific drug use symptoms.

— Figure 5.3. About Here —

*LTA applications:* Many LCA software programs are now available, such as the Maximum Likelihood Latent Structure Analysis (MLLSA) (Clogg, 1977; MLLSA, 2000a) Win-LTA (WinLTA, 2000b), and Mplus (MPlus, 2000c). We have chosen WinLTA, with which we have extensive experience, primarily because of its ability to estimate transition rates. Transition rates, class probabilities, and endorsement patterns are simultaneously obtained in WinLTA by means of the expectation-maximization (EM) algorithm, an iterative process used to maximize the log likelihood function, \( P(Y) \) in Equation 5.1. Although standard errors are not easily available, they can be
estimated using a Newton-Raphson method or by bootstrapping if source codes are available. In this monograph, only rates are reported, however. The minimum recommended sample size for a LTA analysis is 100 (Collins & Wugalter, 1992) therefore, we were able to afford gender-specific models.

*Treatment of missing cases:* The EM algorithm fills in any missing values in the first expectation step according to the parameters estimated by the given starting values. As EM continues the iterative procedure, the parameters estimated by a maximization step are used to re-estimate the values of the next expectation step, until, hopefully, the global maxima are reached.

**Cross-Cultural Hypothesis Testing**

Testing was performed in two steps. In the first step, a base $L^2$ was obtained for a specific combination of sites by estimating without constraining specific transition parameters ($\delta$) of interest. In the second stage, $L^2$ was re-estimated with equality constraints placed on these transition parameters. The difference of the two $L^2$s was then compared to the degrees of freedom lost due to the restrictions on transition rates. An example of the null hypothesis that posits equal transition rates of all five societies is spelled out in Figure 5.3. In certain models, further constraints were imposed, depending on the nature of the measures and logical consequence of a behavior (e.g., alcohol abstainers could not become alcoholics). Details of specific constraints are described where appropriate in subsequent chapters.

**Regression Approach**

LTA gives a probability of falling into a given class as well as a transition rate from a specific class at $t_i$ to a specific class at $t_{i+1}$. However, it does not assign individuals to the latent classes without some modifications. Class assignment has an advantage of being able to take the resultant classification variables to standard statistical packages such as SAS. We shall explain the basics of
the class assignment method and resulting cross-cultural hypothesis testing using logistic regression. This set of analyses was performed in parallel with LTA analyses for the transition from the childhood form to the adult form of antisocial personality to compare results based on the two approaches. Results are reported in Chapter 6.

Assessing Transitions Using a Class Assignment Method

For the purpose of class assignment, the MLLSA program (Clogg, 1977) was used. Because MLLSA does not handle missing data, missing values were first imputed through Stata (StataCorp, 1997) by estimating the missing values with a standard regression and then setting the variable equal to zero or one with a Monte Carlo technique. Estimates can then be obtained for class probability and the endorsement rate of each symptom for each class of the construct for all five countries. Using a posterior probability for each response pattern, MLLSA assigns the response patterns the individual is most likely to meet. SAS, Version 6.12, was used to calculate the response pattern number for each individual and assign this individual to a corresponding latent class.

When LCA and class assignment are carried out for two constructs, such as childhood and adult forms of antisocial personality, then the results of simple $l \times m$ cross-tabulation, where $l$ and $m$ are respective numbers of classes obtained for the two constructs, are conceptually equivalent to transition matrices obtained by direct estimates of transition rates computed by WinLTA. Transition rates obtained by the class assignment method vs. WinLTA estimation are shown schematically in Figure 5.4. The solid arrows show the flows of the procedure by means of the class assignment method using MLLSA; while broken arrows show the flows based on the WinLTA estimation procedure. It should be noted that it is still possible to apply a class assignment method to WinLTA, although we did not explore it. However, all results reported in this monograph that used the class
assignment method utilized MLLSA.

Cross-Cultural Hypothesis Testing

Using transition tables obtained by means of class assignment, two types of hypothesis testing were performed. The first type of testing consisted of logistic regressions performed for each country independently to assess the increased risk of being in the “affected” class for the outcome construct (e.g., adult form of ASP) given that the individual was in the affected class of the childhood conduct syndrome. This type of analysis was possible only through class assignment. For the second type, a “sequential” logistic regression analysis (Kleinbaum, 1994) was utilized. The procedure involves performing a logistic regression on the outcome class by the class in childhood conduct syndrome and selected sites, followed by another logistic regression performed, with an addition of the interaction term for site and class in childhood conduct syndrome. The difference in the $\chi^2$ values and the difference in the degrees of freedom were used to test whether the interaction term was significant, which indicates that transition rates differed across the selected sites. For the second type of analysis, results of cross-cultural hypothesis testing of transition rates ($\hat{\phi}$) using WinLTA can be compared for consistency of results (See the lower portion of Figure 5.4.).

Another approach that was considered but not used was the random regression model (hierarchical multi-level model) (Gibbons, Waternaux, Hedeker, & Davis, 1988; Hedeker, 1993). This modeling technique is useful for estimating the effect on contexts such as societies and on individuals simultaneously. However, after preliminary analyses, this approach was not pursued further because the assumption of the five international sites being randomly drawn from an “infinite” number of societies was problematic. Indeed, the random effect of different sites could be
estimated only as an aggregate effect; thus this approach does not allow assessing site specific parameters of the effect of conduct syndrome on an outcome variable, nor would it allow cross-cultural hypothesis testing of site differences on the parameters.

**Structural Equation Modeling Approach**

Structural equation modeling (SEM) (Bollen, 1989; Joreskog, & Sorbom, 1979) was also considered as a way to examine the effect of the childhood form of antisocial personality (ASP) behavior on the outcomes of the adult form of antisocial personality, alcoholism, and drug abuse, as well to examine the cross-cultural appropriateness of indicators of these constructs.

Figure 5.5 describes an operational model, which is conceptually equivalent to the LTA two-stage model. For brevity’s sake, specific parameters are not listed, but the structural parameter (\( \hat{\alpha} \)), estimating the effect of the dimensional construct of the childhood conduct syndrome on an outcome construct is an equivalent to a transition rate in LTA; factor loadings (\( \hat{\varepsilon} \)) estimate the strengths of indicators in measuring the underlying latent construct. The multiple group analysis in SEM can then be used to test equality of selected parameters across five international sties.

--- Figure 5.5. About Here ---

A series of analyses first examined the measures of childhood and adult forms of ASP and assessment of the transition rates. The project shifted to the latent class analyses (LCA) and its extension to latent transition analyses (LTA) after this point for two reasons: Methodological difficulties in estimating parameters of interest due to the mathematical and estimation problem of “positive indefiniteness,” and the easier interpretation of resulting estimates when the underlying construct is described in a discrete nature as in the LCA/LTA approach, rather than described in a dimensional nature as in the SEM approach. To solve the positive indefiniteness problems, two
potential remedies were applied but both yielded unsatisfactory results. Details of SEM estimation, results, and problems encountered with the SEM approach, which has relevance for cross-cultural research are presented in Appendix B. Examples are drawn from analyses of childhood to adult forms of antisocial personality there.

**Summary**

In this chapter, we introduced the latent class analysis and its extension, latent transition analysis, the logistic regression approach in combination with LCA class assignment methods, and structural equation models. LTA allows “direct” estimates of transition rates, while in the logistic regression approach, transition rates are estimated from assigning individuals to specific classes. Structural equation modeling was briefly described, but based on preliminary analyses, we shifted the focus of our examination to LCA/LTA approaches.
Figure 5.1. Latent Class Analysis: Schematic Presentation

Note. Class is a latent class; item is an endorsement of each symptom. A detailed description of the LCA method is described in Appendix A.
Figure 5.2. Latent Transition Analysis: Schematic Presentation

Note. Class is a latent state. Item is an observed response.
Figure 5.3. Example of Latent Transition Analysis Three-Stage Transition Model

Cross-cultural hypotheses:
\[ \tau_{ij1}^{US} \equiv \tau_{ij1}^{CAN} \equiv \tau_{ij1}^{NZ} \equiv \tau_{ij1}^{TW} \equiv \tau_{ij1}^{SK} \]
\[ \tau_{kl2}^{US} \equiv \tau_{kl2}^{CAN} \equiv \tau_{kl2}^{NZ} \equiv \tau_{kl2}^{TW} \equiv \tau_{kl2}^{SK} \]

Note. i, j, k, l indicate a class at each stage. US = USA, CAN = Canada, NZ = New Zealand, SK = South Korea, and TW = Taiwan. ASP is Antisocial Personality Disorder. J is a latent transition rate in Equation 5.1.
Figure 5.4. Two Class Assignment Methods and Hypothesis Testing

Latent Class Probabilities \[\rightarrow\] Modal Probabilities for Specific Cells

\[\downarrow\] Transition Tables

\[\downarrow\] Individual Class Assignment

Site-Specific to Test Impact of Childhood Problems

\[\downarrow\] Site-Combined to Test Cross-Cultural Hypotheses

Class assignment method using MLLSA

Direct transition method using WinLTA
Figure 5.5. Indicator Assessment Using Structural Equation Modeling
Chapter 6.

Transitions from Childhood to

Adult Forms of Antisocial Personality

Antisocial personality (ASP) presents a disabling and persisting disorder marked by a pattern of irresponsible, antisocial behavior and a disregard for and violation of the rights of others (American Psychiatric Association, 1980; American Psychiatric Association, 1987). Deceitfulness, impulsiveness, irritability, aggressiveness, recklessness, irresponsibility, and a lack of remorse characterize ASP (American Psychiatric Association, 1994). Among adults, ASP is associated with criminality, alcohol and drug abuse, and an increased risk of early mortality (Robins, 1966; Robins, Tipp, & Przybeck, 1991). ASP follows a chronic course but can become less evident or remit as an individual grows into middle age (American Psychiatric Association, 1987). The prevalence of antisocial personality disorder in American community samples has been estimated at about 3% in males and about 1% in females; in clinical settings, the prevalence typically varies from 3 to 30% (American Psychiatric Association, 1994). A familial pattern has been observed, with evidence that genetic and environmental factors contribute to the risk for ASP (Crowe, 1974; Lyons et al., 1995).

In the current psychiatric classification, ASP is considered to begin in childhood or early adolescence and continue into adulthood. Such a childhood form of antisocial behavior, typically termed childhood conduct syndrome and reviewed in detail in Chapter 2, manifests itself through

aggression, destructiveness, deceitfulness, theft, and violations of age-appropriate rules (American Psychiatric Association, 1994). Its predictive relationship to adult ASP has been long supported by empirical studies (Robins, 1966; Robins, Tipp, J, & Przybeck, 1991). Links between childhood antisocial behavior and other adult psychiatric disorders also have been suggested (Cloninger & Guze, 1970; Rimmer & Jacobsen, 1980). The Epidemiologic Catchment Area (ECA) Program initiated by the U.S. National Institute of Mental Health, described in Chapter 5, was the first general-population survey of ASP that applied a DSM diagnostic criteria (Robins & Price, 1991). A key finding of the study was the confirmation of expected associations between child and adult antisocial personality disorder and other associated behaviors, such as substance abuse, found in previous studies of more limited populations (Robins & Price, 1991). Although childhood conduct syndrome predicted a wide range of adult psychopathology, the predictive ability was highest for the adult form of ASP. Childhood conduct syndrome’s associations with drug and alcohol abuse also were strong but not as strong as for the adult form of ASP (Price, 1991).

As already noted in Chapter 3, cross-national studies on psychiatric disorders that used a uniform assessment approach similar to ours have been explored for several areas including depression (Kleinman & Good, 1985; Weissman et al., 1996), panic disorder (Weissman et al., 1997), schizophrenia (Sartorius et al., 1986), pathways to care (Gater et al., 1991), and primary care for mental illness (Ustun & Sartorius, 1995). Cross-cultural issues in ASP include questions on the universal existence of the disorder, whether or not extant diagnostic criteria apply universally, whether or not the developmental path to ASP is the same in non-Western cultures, and whether or not risk and protective factors are the same across cultures.

Of particular interest in this chapter is the cross-cultural applicability of ASP’s continuity from
the childhood to adult form. A substantial proportion of conduct problem children remit. Also, for a substantial proportion of adult antisocials without childhood history of conduct problems, their ASP symptoms may be a consequence of other problems, such as substance abuse (Brooner, Schmidt, Felch, & Bigelow, 1992; Cottler, Price, Compton, & Mager, 1994). Therefore, a degree of plasticity of association is inferred, which could be attributable to norms and practices specific to a society, or individual differential vulnerability to developmental progression.

The results of descriptive analyses for all sites but South Korea are available in an earlier article, which was produced before the South Korean dataset became available. From very detailed descriptive analyses conducted at that time, we have concluded that the syndrome of ASP does exist in different countries. Among those who have ASP, a broad pattern of child and adult symptoms, early age of onset, and comorbidity with substance abuse or dependence are similar across all countries, suggesting it is the same disorder in all countries examined. The criteria used in DSM-III, derived from studies of samples in the United States, appear relevant in other countries, including Taiwan, as a non-Western country considered. Nonetheless, the lifetime prevalence rate of definite ASP among the Taiwanese was exceedingly low, 0.3% in males and 0.0% in females. The association between the childhood and adult forms of ASP also seemed to hold in all four countries; however, there appeared to be quantitative differences in continuity (Zoccolillo, Price, & Ji, 1998).

This chapter extends these previous descriptive comparisons to include South Korean data. This inclusion allows us to state with better confidence if the major difference in prevalence reflects a West-East disjuncture or Taiwan happening to be a country with very different levels of ASP. Our analytical strategy is drastically different in this chapter compared to the earlier descriptive examination. Introduced in Chapter 5, latent class analysis (LCA) (Goodman, 1978; McCutcheon,
1987) is employed here to examine discrete structures of both the childhood and adult forms of antisocial personality. Eaves et al.’s study (1993) of an American twin sample indicated that three to four classes adequately describe the symptom profile of conduct disorder. The LCA analyses by Zoccolillo et al. (1992) showed that English children who did not meet clinical criteria of conduct disorder nevertheless experienced pervasive social malfunctioning as adults, suggesting that diverse expressions of the childhood disorder in the population considered may not have been adequately captured by DSM clinical criteria. Latent transition analysis (LTA) (Collins & Wugalter, 1992; Graham, Collins, Wugalter, Chung, & Hansen, 1991) is applied to assess cross-national differences in patterns of transitions from childhood conduct syndrome and adult antisocial behavior. The use of LCA/LTA also allowed testing cross-cultural hypotheses on latent transition probabilities. Expressions of specific behaviors are also examined using LCA/LTA. These patterns are examined separately for males and females to address gender differences, which ostensibly might have produced cross-cultural differences in prevalence rates in the past.

Measures

Introduced briefly in Chapter 4, observed measures of childhood conduct syndrome and adult form of ASP were derived from the sections assessing adult antisocial personality disorder and sexual dysfunction in the Diagnostic Interview Schedule, Version III (DIS-III) (Robins, Helzer, Croughan, Williams, & Spitzer, 1981) or the translated Korean and Chinese versions of the DIS-III. Table 6.1 lists childhood and adult diagnostic criteria for ASP based on DSM-III symptom criteria. Appendix C lists the questions from the DIS III-A, used in the St. Louis site. Appendix D includes prevalence rates of all ASP measures used in this chapter.

Childhood Conduct Syndrome
The 12 childhood questions included behaviors about truancy, expulsion/suspension from school, arrest or being sent to juvenile court, running away, repeated lying, early sexual relations, early use of alcohol or drugs, stealing, vandalism, poor grade or underachievement, trouble at school, and trouble with starting fights. The childhood symptom of any sexual relations was not used because questions in the sexual relation/behavior section were not asked in the South Korean study and were not used to compute ASP measures in Edmonton. Thus a total of 11 symptoms were used in the subsequent LCA/LTA analyses.

— Table 6.1. About Here —

**Adult Antisocial Personality Behavior**

The nine adult ASP symptoms included work problems, parental neglect, legal problems, marital or other relationship problems, violence, debts, vagrancy, frequent lying, and traffic offenses. Among adult symptoms, two symptoms were excluded from the LCA/LTA analyses: The negligent parenting symptom was not used because of differences in the practice of care for young children between Eastern and Western societies. In South Korea and Taiwan, it was common in the 1980's for young children to be communally cared for through the existence of extended kinship and neighborhood networks. Thus, leaving young children at home really was not a culturally appropriate indicator of parental neglect (Zoccolillo, Price, & Ji, 1998). The prevalence of this measure was consequently inflated in these countries. The symptom of debt was not used because this question was attached at the end of the instrument’s sexual relation/behavior section, and so was omitted from sites that did not include this section in the survey or did not use questions in this section to compute ASP measures. A total of seven symptoms were used in the LCA/LTA analyses. Adult symptoms were changed from original scale variables to binary variables to minimize the number of response
Analysis Strategies

Latent Class Selection

To select the proper number of classes for childhood and adult symptoms of ASP, two programs were used that applied different strategies.

_LCA using MLLSA:_ Initially, the Maximum Likelihood Latent Structure Analysis (MLLSA) (MLLSA, 2000) program originally developed by Clogg (1977) was used for latent class analyses. Because MLLSA does not handle missing data, missing values were imputed through Stata (StataCorp, 1997) by estimating the missing values with a standard regression and then setting the variable equal to zero or one with a Monte Carlo technique. Estimates were obtained for class probability and the endorsement rate of each symptom for each class for all five countries using first childhood symptoms then adult symptoms, separately by gender. MLLSA estimated results for both sexes simultaneously; the rates received differing sets of estimates but only one model fit parameter.

_LCA using WinLTA:_ WinLTA (WinLTA, 2000) was later used to evaluate these models even though there were no latent transitions, by setting it to a single time frame. WinLTA was used because it can accommodate missing data. Two-class and three-class models were computed in each instance. Genders were estimated separately in WinLTA.

Class selection evaluation: Class selection evaluation was based primarily on the likelihood ratio $L^2$ (-2 log likelihood) and the Pearson $\chi^2$, which assess the fit (or lack of fit) of the model as these measures should behave as chi-square distributions with the number of degrees of freedom depending on the number of total possible outcomes and the number of free parameters. In evaluating models, three criteria were considered. For simple models, the standard parsimonious

patterns.
method can be used. In this approach, the number of latent classes is increased until the $L^2$ score is not rejected at the given number of degrees of freedom.

In complicated models, the $L^2$ score does not relate very well to the degrees of freedom because the large number of empty cells greatly inflate the degrees of freedom. The parsimonious method cannot be applied; it would force the selection of the independent model in all cases. For these more complicated models, the number of latent classes can be viewed as a nested model. The method is equivalent to equating the endorsement rates of two classes to form one larger class. Though not without its own methodological problems, the difference of the $L^2$ values in the nested model method should be in line with the difference in the degrees of freedom.

Attention was paid to select the number of classes that would be most appropriate across the five international sites so that there would be the same number of transition rate cells, which is necessary for multigroup cross-cultural hypothesis testing using LTA, and for logistic regression. The endorsement patterns were inspected to see if the EM maximization converged to a pathological case where a class consisted of only a few cells. When this occurred, a smaller number of classes was chosen if it was compatible with the class solution for other sites.

**Transition Analyses**

*Assessing transitions using a class assignment method:* Since it only produces estimates of probabilities, LCA does not assign each observation to a latent class. Using a posterior probability for each response pattern, MLLSA was used to assign the response patterns the individual was most likely to be in. SAS, Version 6.12, was used to calculate the response pattern number for each individual and assign this individual its corresponding latent class. When individuals were assigned to classes of childhood ASP and classes of adult ASP, cross-tabulation of child and adult classes
constitutes a transition matrix of latent classes. This set of analyses were done from gender-combined samples; however, estimates were obtained separately for each gender.

**Latent transition analysis:** In contrast to the class assignment method, transition rates and endorsement patterns were computed directly by WinLTA. Three separate kinds of probabilities are estimated by WinLTA: the probability that any given individual falls into a specific childhood latent class; the probability that the individual endorses a specific ASP symptom, given the class to which the individual belongs; and the estimate of the transition rate from each childhood class to each adult class. The model is specified by the probability of being in a childhood class, the conditional probability of endorsing a specific symptom given the class, and the transition rates ($\hat{\theta}$) from childhood classes to adult classes. WinLTA estimates these parameters by means of the expectation-maximization algorithm. The EM algorithm is an iterative process used to maximize a likelihood function. In consideration for cross-cultural hypothesis testing, transition rates were estimated for each gender separately from the site-combined datasets.

**Cross-Cultural Hypothesis Testing**

**Using the class assignment method:** Using transition tables obtained by assignment of classes, two types of tests were performed. The first type consisted of logistic regressions performed for each country independently to assess the increased risk of being in the “affected” adult ASP class given that the individual is in the affected childhood ASP class. This type of analysis was possible only through class assignment. For the second type, a “sequential” logistic regression analysis (Kleinbaum, 1994) was utilized. This procedure involves performing a logistic regression on the class in adult ASP by the class in childhood conduct syndrome and selected sites, followed by another logistic regression performed, with an addition of the interaction term for site and class in
childhood conduct syndrome. The difference in the $\chi^2$ values and the difference in the degrees of freedom were used to test whether the interaction term was significant, that is whether or not transition rates differed across the selected sites.

Using LTA: The testing mechanism was to evaluate the latent transition rates in the specific sites being tested with the transition rates being free, meaning that different countries could have different transition rates. This produced a base score of -2 log likelihood, $G^2$. Then a second model was evaluated with fixing all free transition parameters to be equal across the countries selected. The two-step procedure thus tested if the transition rate from the childhood first class to the adult first class was the same across the countries being tested. The difference of the two $G^2$ is compared to the degrees of freedom lost due to the restrictions on transition rates.

Results

Class Selection

Latent classes using MLLSA: Table 6.2 summarizes the chi-square and degree-of-freedom information for the 2- and 3-class solutions for childhood and adult ASP symptoms. For childhood symptoms, a high number of symptoms and low prevalence rates of these symptoms proved problematic for LCA estimation among the South Korean and Taiwanese females. The maximum likelihood estimates for symptom endorsement rates did not converge for the female childhood datasets in Taiwan and South Korea. The childhood symptoms section of Table 6.2 for South Korea and Taiwan therefore shows only for results for males.

For childhood symptoms of ASP, the parsimonious approach would be to stop after the second latent class across all five sites. But given the low prevalence and high number of symptoms, it is
possible that the $L^2$ score does not converge to a $\chi^2$ distribution with the given degrees of freedom. Instead, viewing the move from 2 to 3 classes as a nested model indicates that the 3-class solution is a superior model. Class restriction involving many parameters must be used carefully (Holt & Macready, 1989). Nonetheless, there was a drop of the $L^2$ of at least 100 in all sites but Taiwan (drop was only 13), with a small comparative drop in degrees of freedom (7 to 22), implying that the 3-class model is the optimal solution.

The results of $L^2$ statistics for adult ASP symptom classes provided clearer indications to choose a 2-class solution. For the latent class estimations where the data were segregated by gender (but estimations were done simultaneously), the 2-class model was adequate for all sites but the Canadian site. In U.S.A., New Zealand, South Korea, Taiwan, the change from the independent model to the 2-class model provided the most dramatic reductions in the $L^2$ score, ranging from a 63% to 80% reduction in the $L^2$ score. For these four countries, the 2-class model was also the first model that would not be rejected by the chi-square test.

The Canadian adult symptoms behaved differently. Though the reduction in the $L^2$ score from the independent model to the 2-class model was dramatic (75% reduction), the 2-class model must still be rejected at the 0.05 level, so the 3-class model provides the better fit. However, for the necessity to choose the same number of classes across the five sites, the 2-class solution was chosen.

**Latent classes using WinLTA:** Evaluation results from WinLTA statistics are by and large consistent with those obtained by MLLSA. For the models for childhood symptoms, the larger number of symptoms precludes the use of the parsimonious method. In viewing the models as nested models, then, the cut-off $\chi^2$ value for the change of 12 in degrees of freedom is a change of 21.02 in $G^2$ ($-2 \log$ likelihood). All of the models, except the model for Taiwan females, yielded a $G^2$ change
larger than the cutoff value of 21, indicating that a 3-class solution may not be needed for Taiwan females. In general, the 3-class solution was considered optimal for the three western countries. Endorsement patterns for the two Eastern countries exhibited some small pathological classes, especially among females. This indicated that even though the $G^2$ reduction exceeded the cut-off $\chi^2$ value, the 2-class solution may be more reasonable for South Korean females as well as for Taiwan females. Nonetheless, for the sake of the consistency needed for cross-cultural hypothesis testing, the 3-class solution was chosen for all five countries.

— Table 6.3. About Here —

For adult symptoms, the 2-class solution requires a cut-off $\chi^2$ value of 137 with 112 degrees of freedom. Results for females showed that the $\chi^2$ scores were all under the cutoff level for all five countries, indicating that the 2-class solution is acceptable. For males, $\chi^2$ scores above the cutoff level were obtained for all countries except New Zealand, indicating that the 3-class solution may be preferable. The largest drop in $G^2$ from the 2- to 3-class solution was 44 for Canadian males. While this is a significant reduction for the 8 degrees of freedom, the magnitude of drop in the $G^2$ value is not as striking as the drop observed for childhood symptom models. We also observed that the 3-class solution for New Zealand males showed evidence of subtypes that were not seen in any other country or gender. Considering these pieces of information together, the 2-class solution was chosen for adult ASP symptoms.

Patterns of Endorsement

Figure 6.1 depicts differences and similarities in childhood ASP symptom endorsement patterns and in class probabilities across five international sites. The results were obtained from WinLTA, which was run separately for males and females. Results of endorsement patterns obtained from
MLLSA (not shown) were very similar to those from WinLTA, where MLLSA did converge in estimation (discussed below). As mentioned above, based on the comparisons of log likelihood $\frac{\chi^2}{2}$ statistics across different class solutions, the three-class solution was judged optimal for childhood symptoms.

— Figure 6.1. About Here —

Across five countries, the class probability of Class 3, the severest class, was small, ranging from 0% among Taiwan females and South Korea males and females to 7% among Canadian males. A considerable range was observed for the probability of Class 2, the mildly affected class, ranging from 7% among Taiwan females to 34% among U.S. males. These results indicate that the expression of the syndrome varies considerably across countries and gender. However, patterns of endorsement across symptoms were very similar among the three Western countries for males; and more similar than different among females in these countries as well. Among both males and females, truancy, lying, stealing, and school trouble were more commonly endorsed. On the other hand, endorsement patterns between South Korea and Taiwan were different among both males and females, even though class probabilities were more similar between the two Eastern countries compared to the three Western countries. Across the five international sites and gender, there is not much indication of subtypes; it appears that class distinction was based on severity of syndrome, rather than a distinctly different expression of particular symptoms.

Figure 6.2 presents symptom endorsement patterns for adult ASP symptoms. With the 2-class solution imposed across five countries, the class probability of the “affected” class, Class 2, varied from 9% among Taiwan females to 28% among U.S. females. Endorsement patterns were remarkably similar among the three Western countries for both males and females: Work problems,
violence, and traffic problems were among the more commonly endorsed symptoms in men, while work problems and marital/relational problems were more commonly endorsed in women in Western countries. Between the two Eastern societies, endorsement of violence was the most characteristic pattern in men; this also held in women, but the level of endorsement was much lower than the male level in the same country (0.8 in men compared to 0.4 in women in South Korea; 0.5 in men compared to 0.3 in women in Taiwan). Traffic offenses were among the least likely to be endorsed by both men and women in the two Eastern countries. This may be due to the more limited availability of automobiles in those countries at the time surveys were carried out.

The endorsement patterns of childhood and adult forms of ASP suggest that a degree of variation exists during childhood across countries and gender, but adult symptom expressions are less variant and class probabilities are still variant. If in fact a developmental inference is appropriate, it appears that more uniform patterns of antisocial behavior develop across societies, even though childhood antisocial behaviors can be more variant across societies.

**Transition Patterns**

*Using the class assignment method:* The transition rates obtained by the class assignment method are shown in Table 6.4 for estimations of classes that converged in MLLSA. As mentioned, the maximum likelihood estimates for symptom endorsement rates did not converge for the female childhood datasets in Taiwan and South Korea. Thus transition rates were not obtained for these countries among females. If the class assignment using model probabilities was successful, the larger transition rate to the affected class of adult ASP (A2) should be observed with increased severity of childhood conduct syndrome (transition from C3 to A2 is larger than the transition from C2 to A2, which is in turn larger than the transition from C1 to A2); to the extent that there is close association
between childhood and adult forms of ASP. This pattern of the dose-response relationship generally held across five countries and across gender. The pattern was clearest among U.S. males and females; being in the most severe class of childhood conduct syndrome yielded an 83% chance of becoming ASP-positive among men, and 70% among women. However, in other countries, factors other than childhood conduct syndrome also seemed important, so there was a smaller chance of becoming antisocial as an adult even if childhood conduct syndrome was more severe. For example, among Canadian females, the chance was only 25%, compared to 62% among Canadian males. Among Taiwan males, the chance was 33%.

--- Table 6.4. About Here ---

**Using WinLTA**: Results on transition rates more strikingly supported childhood-to-adult continuity of antisocial behavior when transition rates were parametrically estimated by WinLTA. The results are shown in Table 6.5. The prototypical situation is seen in the United States: For both males and females, the probability of being affected by ASP as an adult was 100% if the severest childhood conduct syndrome was experienced. The mild childhood conduct syndrome still lead to adult ASP at 58% for males and 77% for females. Results were similar for Canada and New Zealand, although a bit less striking. Transition patterns were less conforming to the U.S. prototype for South Korea males and females and for Taiwan females. The chance of being in the affected adult ASP class was lower with a history of severe conduct syndrome than with the mild syndrome in these countries. It is not clear if this was in part due to the rarity of the severe childhood ASP class, in that it represented atypical childhood ASP rather than the severest form of childhood ASP.

--- Table 6.5. About Here ---

The reasons for the differences of transition rate results between the MLLSA and WinLTA
methods are not easy to examine. Most likely, the model probability class assignment method may have lead to a considerable degree of misclassification of assignment to classes so that the dose-response relationship between the childhood and adult forms of ASP may have been more blurred. The differences in iterative procedures and different treatments of missing data may also have contributed to the somewhat different results.

Cross-Cultural Differences in Transitions

*Using the class assignment method:* Using the transition rates obtained from the class assignment method, a series of logistic regression runs were performed to assess the significant differences across sites. For the models with the 3-class solution for childhood form of ASP, Class 3 (C3) is a more severely affected class than Class 1 (C1) or Class 2 (C2). Logistic regression determined the increased risk of being in adult ASP Class 2 (A2) based on being in childhood ASP Class 3 (C3) versus Class 1 (C1).

As shown in Table 6.6, all odds ratios were much larger for Class 3 than Class 2 except for females in Canada and New Zealand. The highest odds ratios were seen among U.S. males in Class 3 (29.6) and the lowest was observed for South Korea (11.8). All odds ratios were significant at the p < .05 level or lower, except those for the 2-class solutions for Canada and New Zealand, and Taiwan’s 3-class solution.

— Table 6.6. About Here —

Table 6.7 summarizes several cross-cultural hypothesis tests used to determine whether or not transition rates from childhood to adult form of ASP were constant across all five international sites or combinations of selected sites, based on the MLLSA class assignment method. The test results are shown for the 3-class solutions for child symptoms and 2-class solutions for adult symptoms.
Differences were most dramatic for Eastern versus Western sites, although testing for all five sites against each other was also significant. The United States, Canada, and New Zealand did not show significant differences from each other in transition rates. Rates between South Korea and Taiwan significantly differed for males. Due to nonconversion, only a test for assessing the differences among three Western countries was possible for females. As expected, the result suggests no significant difference among the three Western countries.

— Table 6.7. About Here —

Using WinLTA: Using constraints across all or selected societies, cross-cultural hypothesis testing also was carried out in WinLTA. Differences were tested among all 5 countries, between the combined Eastern and Western sites, between South Korea and Taiwan, and among the three Western sites. Table 6.8 shows the results. Hypothesis testing for all five countries among males and South Korea versus Taiwan among males yielded a negative value of the $L^2$ differences in the second step, indicating errors in estimation iteration process. These results are not shown in the table.

Only the test for the East versus West produced significant results for both males and females. There is no evidence of a difference in transition rates between the two Eastern countries and the three Western countries. The differences for women among all five countries also were not significant, most likely to do the lack of significance among the Eastern and Western countries.

Summary Findings

Gender differences in item endorsement patterns across five sites were clearer in the adult syndrome of ASP than in the childhood syndrome. Expressions of Asian female conduct problems and antisocial behavior could be so different from those of Western males’ that the validity of the Western-male based model may need reconsideration. However, significant underreporting is
another possible explanation.

Class structure: It appears that class structure was relatively uniform for the adult patterns, but considerable variability was observed for the class structure of the childhood symptoms. Two-class models appeared to be most informative for the adult syndrome across five sites. Three-class models were most informative for the childhood syndrome in Western societies. Across the five societies, the classes appeared to reflect the underlying severity of child and adult antisocial syndrome, and no indication of subtypes of these syndromes was observed, such as the DSM-III subtypes of conduct disorder. The analysis of structural equation models parallel to those by LCA (not shown) indicated, however, that factors may not be very consistent with the interpretations of severity being a primary factor for class distinction.

Cross-cultural differences: In general, DSM-III based indicators of childhood and adult ASP appeared to be acceptable across the five societies considered. Nonetheless, extremely low endorsements of almost all items in the two Eastern societies, especially in Taiwan, raises the possibility that DSM-III based indicators may have missed some culturally specific expressions of antisocial behavior. Evidence for a strong link between childhood behaviors and adult symptoms for ASP existed across the five countries considered. Increased odds ratios for being in the affected adult ASP class were shown for individuals with a history of mild or severe childhood conduct syndrome across five countries, suggesting that the DSM approach can be applied universally with modifications in measures. Testing for transition rates clearly showed pervasive differences between the East (South Korea and Taiwan) and the West (St. Louis, Edmonton, and New Zealand). These results suggest cross-national differences could rise from differences in the prevalence rate of childhood symptoms, with paths to adult ASP affected by different norms, customs, and socialization.
in adolescence and adulthood.

Gender differences: Several gender differences were found, which indicate that expressions of Asian female conduct syndrome and adult antisocial behavior are so different that the validity of the Western-male based model may need reconsideration. Endorsement patterns were considerably different between males and females in the three Western countries, which are more noticeable than differences in endorsement patterns across the three countries within the same gender. It appears that these gender differences in expression of conduct syndrome and adult antisocial behaviors could well be a major reason for the differences in prevalence; however, the transition rates from the childhood to the adult form of ASP were less distinct between the two genders.
Table 6.1. Antisocial Personality Disorder Childhood and Adult Symptom Criteria: Diagnostic and Statistical Manual of Mental Disorders (DSM-III)

Twelve childhood symptom criteria (ages less than 15 years)

- Truancy, at least 5 days per year in two years
- Expelled or suspended from school
- Arrested or sent to juvenile court
- Ran away from home overnight more than once
- Told many lies
- Any sexual relations
- Used drugs or drank more than once
- Stole more than once
- Vandalism
- Poor grades and teachers thought could do better
- Frequently in trouble with teacher/principal at school
- Got into trouble for starting fights

Nine adult symptom criteria (ages 18 years and older)

- Work problems
- Negligent parenting
- Illegal activities
- Marital/relationship problems
- Violence
- Debts
- Vagrancy
- Lying
- Traffic offenses

\(^a\)Not used in data analyses.
Table 6.2. Latent Class Selection Using MLLSA

<table>
<thead>
<tr>
<th>Site</th>
<th>Independence</th>
<th>Two-class</th>
<th>Three-class</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L^2</td>
<td>d.f.</td>
<td>L^2 % Reduction^a</td>
</tr>
<tr>
<td>Childhood symptoms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St. Louis, U.S.A.</td>
<td>1,589</td>
<td>4,072</td>
<td>1,280</td>
</tr>
<tr>
<td>Edmonton, Canada</td>
<td>1,803</td>
<td>4,072</td>
<td>1,231</td>
</tr>
<tr>
<td>Christchurch, N.Z.</td>
<td>1,018</td>
<td>4,072</td>
<td>839</td>
</tr>
<tr>
<td>South Korea^b</td>
<td>871</td>
<td>2,036</td>
<td>534</td>
</tr>
<tr>
<td>Taiwan^b</td>
<td>1,420</td>
<td>2,036</td>
<td>459</td>
</tr>
</tbody>
</table>

| Adult symptoms    |      |      |                     |      |                     |      |
| St. Louis, U.S.A. | 1,050 | 240  | 256                        | 224  | 202                        | 209  |
| Edmonton, Canada  | 1,245 | 240  | 297                        | 224  | 208                        | 209  |
| Christchurch, N.Z.| 566  | 240  | 211                        | 224  | 174                        | 211  |
| South Korea       | 768  | 240  | 156                        | 225  | 119                        | 217  |
| Taiwan            | 658  | 240  | 183                        | 225  | 150                        | 214  |

Note. d.f.: degrees of freedom.
^aPercent reduction in L^2 compared to (M-1) class model. ^bMales only because of nonconvergence of data for females.
*P > .01 for X^2_diff. = 13. d.f._diff = 4.
Table 6.3. Latent Class Selection Using WinLTA

<table>
<thead>
<tr>
<th>Site</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>G^2 for 2 classes</td>
<td>G^2 reduction from 2 to 3 classes</td>
</tr>
<tr>
<td>St. Louis, U.S.A.</td>
<td>1,140</td>
<td>127</td>
</tr>
<tr>
<td>Edmonton, Canada</td>
<td>889</td>
<td>138</td>
</tr>
<tr>
<td>Christchurch, New Zealand</td>
<td>475</td>
<td>48</td>
</tr>
<tr>
<td>South Korea</td>
<td>1,232</td>
<td>23</td>
</tr>
<tr>
<td>Taiwan</td>
<td>1,080</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>Degrees of freedom (d.f.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2,024</td>
<td>12</td>
</tr>
<tr>
<td>Cutoff ^2b</td>
<td>2,130</td>
<td>21</td>
</tr>
<tr>
<td>Child</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adult</td>
<td></td>
<td></td>
</tr>
<tr>
<td>St. Louis, U.S.A.</td>
<td>140</td>
<td>17</td>
</tr>
<tr>
<td>Edmonton, Canada</td>
<td>169</td>
<td>44</td>
</tr>
<tr>
<td>Christchurch, New Zealand</td>
<td>109</td>
<td>24</td>
</tr>
<tr>
<td>South Korea</td>
<td>266</td>
<td>31</td>
</tr>
<tr>
<td>Taiwan</td>
<td>191</td>
<td>31</td>
</tr>
<tr>
<td>Degrees of freedom (d.f.)</td>
<td>112</td>
<td>8</td>
</tr>
<tr>
<td>Cutoff ^2c</td>
<td>138</td>
<td>16</td>
</tr>
</tbody>
</table>

Note. The number of classes (statuses) for each stage was chosen separately, based on evaluation of the reduction in G^2, relative to the degrees of freedom. The difference of G^2's takes the ^2 distribution, for which a cutoff value was obtained.

^aTwo classes more parsimonious. ^b^2 value for d.f. = 12 to choose between 2 and 3 classes, p #.05. ^c^2 value for d.f. = 8 to choose between 2 and 3 classes, p #.05.
Table 6.4. Transition Rates Using MLLSA Class Assignment Method

<table>
<thead>
<tr>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>A1 A2</td>
<td></td>
</tr>
<tr>
<td>C1 .86 .14</td>
<td>C1 .84 .16</td>
</tr>
<tr>
<td>St. Louis, U.S.A. (Male n = 970) (Female n = 1,432)</td>
<td>C2 .54 .47</td>
</tr>
<tr>
<td>C2 .58 .42</td>
<td></td>
</tr>
<tr>
<td>C3 .17 .83</td>
<td>C3 .30 .70</td>
</tr>
<tr>
<td>A1 A2</td>
<td></td>
</tr>
<tr>
<td>C1 .88 .12</td>
<td>C1 .95 .05</td>
</tr>
<tr>
<td>Edmonton, Canada (Male n = 1,207) (Female n = 1,692)</td>
<td>C2 .79 .21</td>
</tr>
<tr>
<td>C2 .65 .35</td>
<td></td>
</tr>
<tr>
<td>C3 .38 .62</td>
<td>C3 .75 .25</td>
</tr>
<tr>
<td>A1 A2</td>
<td></td>
</tr>
<tr>
<td>C1 .95 .05</td>
<td>C1 .89 .11</td>
</tr>
<tr>
<td>Christchurch, New Zealand (Male n = 504) (Female n = 994)</td>
<td>C2 .66 .34</td>
</tr>
<tr>
<td>C2 .84 .16</td>
<td></td>
</tr>
<tr>
<td>C3 .61 .39</td>
<td>C3 .60 .40</td>
</tr>
<tr>
<td>A1 A2</td>
<td></td>
</tr>
<tr>
<td>C1 .86 .15</td>
<td>South Korea(^a) (Male n = 2,247)</td>
</tr>
<tr>
<td>C2 .60 .40</td>
<td></td>
</tr>
<tr>
<td>C3 .33 .67</td>
<td></td>
</tr>
<tr>
<td>A1 A2</td>
<td></td>
</tr>
<tr>
<td>C1 .96 .04</td>
<td>Taiwan(^a) (Male n = 5,233)</td>
</tr>
<tr>
<td>C2 .82 .18</td>
<td></td>
</tr>
<tr>
<td>C3 .67 .33</td>
<td></td>
</tr>
</tbody>
</table>

**Note.** C1, C2, C3 are three classes of childhood ASP separated by severity; A1 and A2 are two classes of adult ASP separated by severity. The higher the class number, the more severe the syndrome. Probabilities may not add to 1 because of rounding.

\(^{a}\)Female data excluded because of nonconvergence.
Table 6.5. Transition Rates Using the WinLTA Direct Estimation

<table>
<thead>
<tr>
<th>Male (n = 10,361)</th>
<th>Female (n = 11,654)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 A2</td>
<td>A1 A2</td>
</tr>
<tr>
<td>C1 .95 .05</td>
<td>St. Louis, U.S.A.</td>
</tr>
<tr>
<td>C2 .42 .58</td>
<td>C1 .90 .10</td>
</tr>
<tr>
<td>C3 0 1</td>
<td>C2 .23 .77</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>A1 A2</td>
<td></td>
</tr>
<tr>
<td>C1 .96 .04</td>
<td>Edmonton, Canada</td>
</tr>
<tr>
<td>C2 .54 .46</td>
<td>C1 .95 .05</td>
</tr>
<tr>
<td>C3 .06 .94</td>
<td>C2 .27 .73</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>A1 A2</td>
<td></td>
</tr>
<tr>
<td>C1 .93 .07</td>
<td>Christchurch, New Zealand</td>
</tr>
<tr>
<td>C2 .34 .66</td>
<td>C1 .95 .05</td>
</tr>
<tr>
<td>C3 .58 .42</td>
<td>C2 .43 .57</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>A1 A2</td>
<td></td>
</tr>
<tr>
<td>C1 .98 .02</td>
<td>South Korea</td>
</tr>
<tr>
<td>C2 .47 .53</td>
<td>C1 .97 .03</td>
</tr>
<tr>
<td>C3 .03 .97</td>
<td>C2 .26 .74</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>A1 A2</td>
<td></td>
</tr>
</tbody>
</table>

Note. C1, C2, C3 are three classes of childhood ASP separated by severity; A1 and A2 are two classes of adult ASP separated by severity. The higher the class number, the more severe the syndrome. Probabilities may not add to 1 because of rounding. Rates for all five countries were estimated simultaneously as a basis for transition hypothesis testing.
Table 6.6. Odds Ratios for Increased Risk for Adult Antisocial Personality Given Childhood Problems Using the MLLSA Class Assignment Method

<table>
<thead>
<tr>
<th>Site</th>
<th>Combined male and female</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>St. Louis, U.S.A.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C2: 3.9</td>
<td>C2: 4.5</td>
<td>C2: 4.6</td>
</tr>
<tr>
<td></td>
<td>C3: 14.8</td>
<td>C3: 29.6</td>
<td>C3: 12.5</td>
</tr>
<tr>
<td>Edmonton, Canada</td>
<td>C2: 4.1</td>
<td>C2: 4.2</td>
<td>C2: 4.9†</td>
</tr>
<tr>
<td></td>
<td>C3: 13.8</td>
<td>C3: 12.6</td>
<td>C3: 6.1</td>
</tr>
<tr>
<td>Christchurch, New Zealand</td>
<td>C2: 4.0</td>
<td>C2: 3.9</td>
<td>C2: 4.4†</td>
</tr>
<tr>
<td></td>
<td>C3: 11.0</td>
<td>C3: 13.2</td>
<td>C3: 5.5</td>
</tr>
<tr>
<td>South Korea a</td>
<td>C2: 4.1</td>
<td>C2: 3.9</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>C3: 12.9</td>
<td>C3: 11.8</td>
<td>--</td>
</tr>
<tr>
<td>Taiwan a</td>
<td>C2: 6.4</td>
<td>C2: 5.9</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>C3: 6.8</td>
<td>C3: 13.4</td>
<td>--</td>
</tr>
</tbody>
</table>

Note. C2 is odds ratio for transition from Class 2 of Child of the 3-class solution to Class 2 of Adult. C3 is odds ratio for transition from Class 3 of Child of the 3-class solution to Class 3 of Adult. All ratios p < .05 except where footnoted.

aMales only because of nonconvergence of data for female.

†Not significant at .05 level.
### Table 6.7. Transition Rates Using the MLLSA Class Assignment Method: Cross-Cultural Hypotheses

<table>
<thead>
<tr>
<th>Hypotheses tested</th>
<th>$\chi^2$</th>
<th>d.f.</th>
<th>p</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined male and female</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All 5 societies different from each other</td>
<td>17.06</td>
<td>4</td>
<td>0.002*</td>
<td>22,016</td>
</tr>
<tr>
<td>Eastern sites versus Western sites</td>
<td>20.63</td>
<td>1</td>
<td>0.001*</td>
<td>22,016</td>
</tr>
<tr>
<td>South Korea versus Taiwan</td>
<td>2.90</td>
<td>1</td>
<td>0.089</td>
<td>15,217</td>
</tr>
<tr>
<td>Western sites (United States, Canada, New Zealand)</td>
<td>4.84</td>
<td>2</td>
<td>0.086</td>
<td>6,799</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All 5 societies different from each other</td>
<td>16.13</td>
<td>4</td>
<td>0.003*</td>
<td>10,361</td>
</tr>
<tr>
<td>Eastern sites versus Western sites</td>
<td>26.65</td>
<td>1</td>
<td>0.001*</td>
<td>10,361</td>
</tr>
<tr>
<td>South Korea versus Taiwan</td>
<td>7.01</td>
<td>1</td>
<td>0.008*</td>
<td>7,680</td>
</tr>
<tr>
<td>Western sites (United States, Canada, New Zealand)</td>
<td>2.77</td>
<td>2</td>
<td>0.25</td>
<td>2,681</td>
</tr>
<tr>
<td>Female$^a$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western sites (United States, Canada, New Zealand)</td>
<td>0.224</td>
<td>3</td>
<td>0.894</td>
<td>3,574</td>
</tr>
</tbody>
</table>

Note. $\chi^2$ is the difference in $\chi^2$ scores between the logistic model with “interaction terms” and the logistic model without interaction terms. d.f.: degrees of freedom.

$^a$Hypotheses tested did not include females for Eastern sites because of nonconvergence.

*p < .05.
Table 6.8. Transition Rates: Cross-Cultural Hypotheses Using WinLTA Direct Estimation

<table>
<thead>
<tr>
<th>Hypotheses tested</th>
<th>L²</th>
<th>d.f.</th>
<th>p</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eastern sites versus Western sites</td>
<td>9.377</td>
<td>3</td>
<td>.02467*</td>
<td>10,361</td>
</tr>
<tr>
<td>Western sites (United States, Canada, New Zealand)</td>
<td>2.75</td>
<td>6</td>
<td>.8395</td>
<td>2,681</td>
</tr>
<tr>
<td>(United States, Canada, New Zealand) different from each other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All 5 societies different from each other</td>
<td>14.932</td>
<td>12</td>
<td>.2452</td>
<td>11,654</td>
</tr>
<tr>
<td>Eastern sites versus Western sites</td>
<td>23.782</td>
<td>3</td>
<td>.00003*</td>
<td>11,654</td>
</tr>
<tr>
<td>South Korea versus Taiwan</td>
<td>1.065</td>
<td>3</td>
<td>.9830</td>
<td>7,536</td>
</tr>
<tr>
<td>Western sites (United States, Canada, New Zealand)</td>
<td>6.656</td>
<td>6</td>
<td>.3538</td>
<td>4,118</td>
</tr>
<tr>
<td>(United States, Canada, New Zealand) different from each other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. $L^2 (-2 \log \text{likelihood})$ is the increase in $G^2$ when the transition rates ($\hat{\theta}_{ij}$) are constrained to be equal, compared to $G^2$ where the transition rates were free parameters. d.f.: degrees of freedom.

*aHypotheses tested are not included for all five sites and South Korea versus Taiwan because $L^2$ yielded a negative value, indicating errors in estimation iterations.

*p < .05.
Figure 6.1. Endorsement Patterns of Childhood Conduct Syndrome

Male

St. Louis, U.S.A.

Edmonton, Canada

Christchurch, New Zealand

South Korea

Taiwan

Female

Class 1 - 74%
Class 2 - 24%
Class 3 - 2%

Class 1 - 73%
Class 2 - 21%
Class 3 - 6%

Class 1 - 75%
Class 2 - 20%
Class 3 - 5%

Class 1 - 94%
Class 2 - 5%
Class 3 - 1%

Class 1 - 93%
Class 2 - 7%
Class 3 - 0%

Male Female

Truant Exploited/robbed Run away Lying Alcohol use/15 Stealing Poor grades School trouble Starts fights
Figure 6.2. Endorsement Patterns of Adult Symptoms of Antisocial Personality Disorder

Male

Female

St. Louis, U.S.A.

Edmonton, Canada

Christchurch, New Zealand

South Korea

Taiwan

Work problems

Illegal activities

Marital/Rel. problems

Violence

Vagrancy

Lying

Traffic offenses

Class 1 - 78%
Class 2 - 22%

Class 1 - 79%
Class 2 - 21%

Class 1 - 84%
Class 2 - 16%

Class 1 - 80%
Class 2 - 20%

Class 1 - 83%
Class 2 - 17%

Class 1 - 87%
Class 2 - 13%

Class 1 - 72%
Class 2 - 28%

Class 1 - 79%
Class 2 - 21%

Class 1 - 82%
Class 2 - 18%

Class 1 - 91%
Class 2 - 9%

Class 1 - 79%
Class 2 - 21%

Class 1 - 82%
Class 2 - 18%

Class 1 - 91%
Class 2 - 9%

-Class 1 - 86%
Class 2 - 14%

-Class 1 - 85%
Class 2 - 15%

-Class 1 - 85%
Class 2 - 15%
Chapter 7.

Transitions from Childhood Antisocial Behavior to Alcohol Use and Abuse

In the previous chapter examining the transition from childhood to adult form of antisocial personality, we saw that evidence of a strong link between childhood behaviors and adult symptoms for ASP existed across the five countries. We also confirmed non-negligible differences between the East (South Korea and Taiwan) and the West (St. Louis, Edmonton, and New Zealand), as well as between males and females, with respect to the structure of childhood and adult ASP, endorsement patterns of their symptoms, and transition rates.

What does such investigation yield about the known associated behaviors of antisocial personality -- and consequences of childhood conduct syndrome -- to alcohol abuse and alcoholism? In light of our findings for antisocial personality, a reminder about a few unique features of alcohol use and alcoholism relevant for cross-cultural investigation may be useful in interpreting the findings described in this chapter. For one, humans have imbibed and been inebriated by alcohol for thousands of years. Unlike aggression to other human beings and reckless behaviors that cost others, drinking, and even drunkenness, are considered as part of normal human behaviors in many parts of both the West and East (Babor, 1986; Cho, Kim, & Lee, 1975; Shimizu, 1990; Wada, Price, & Fukui, 1998). There is reason to believe, therefore, that the prevalence of alcohol use and alcoholism, as well as the association of the childhood form of antisocial personality with alcohol use and

alcoholism, are more variant across societies, corresponding to the norms and customs about
drinking in specific societies.

Second, in consideration of the East-West distinction we found for antisocial personality, one
might expect even larger differences in the practice of alcohol use and abuse between those societies
predominantly inhabited by Caucasians, such as the three Western countries included in our research,
and the societies inhabited by Asians, such as Korea and Taiwan. Such an expectation has been
common for those with the knowledge about ethanol sensitivity among Mongoloid races, which has
been recognized for more than a quarter century (Wolff, 1973). The deficiency of the ALDH2
isoenzyme is known to cause high sensitivity to alcohol (Crabb, Edenberg, Thomasson, & Li, 1995).
This sensitivity, also known as the “flushing syndrome,” is most commonly observed among the
Chinese, Japanese, and Koreans. Only 2%-5% of the isozyme deficiency is detected in North
American and Mexican Indians, compared to 40%-50% among the Japanese (Goedde et al., 1986).

Two factors actually make the influence of ALDH2 on alcohol use and alcoholism more variant
than we sometimes are led to believe (See, for example, Ja & Aoki (1993) for a critique). The gene
frequencies of ALDH2*2, the mutant gene that causes sensitivity to alcohol, vary even among Asians
in their native lands. For example, ALDH2*2 gene frequencies are estimated at .239 among the
Japanese and .231 among the Chinese, but at a lower .151 among Koreans (Harada, 1991). The
frequency is near zero for almost all ethnic groups of Caucasians and blacks in Africa. Recall that
we noted in Chapter 4 that the rate of alcohol dependence or abuse meeting the DSM-III criteria is
estimated at 23.2% in South Korea at the time the survey was conducted and that this was higher
than in the three Western societies (16.8% in United States, 17.8% in Canada, and 15.5% in New
Zealand) (See Table 4.3.). This level is curiously high, considering that the prevalence of any use is
47.2%, about 30% lower than in the Western countries (76.6% in United States, 79.0% in Canada, and 77.9% in New Zealand). Koreans themselves attribute their drinking culture to the society’s strong male orientation and permissiveness about drunken behavior (Lee, 1992). Some even have called Koreans the “Irish of the East.” Compared to South Korea’s rate, on the other hand, the prevalence of alcohol use in Taiwan is 34.7%, while its rate of alcohol dependence or abuse is 7.1%. It is unlikely then that these differences in rates of use and abuse are attributable to the difference in gene frequencies of ALDH2. Taiwan researchers, while acknowledging the alcohol sensitivity explanation, suggest sociocultural reasons, such as restricted drinking customs and the absence of popular drinking places (Yeh & Hwu, 1992).

Another possibility is the less known fact of the plasticity of ALDH2’s effect, as is common in most genes. Because ALDH2 is polymorphic, meaning that there exist different subtypes, the gene expression of ALDH2 can differ depending on environment factors and the actions of other genes. Such a gene-environmental interaction of ALDH2 polymorphism is in fact shown most clearly in a recent rapid increase in the proportion of alcoholics with heterozygous ALDH2*1/2*2 (who have both the normal and mutant alleles) among the Japanese in Japan (Higuchi et al., 1994).

Nonetheless, the knowledge of ALDH2’s subtypes as ethnic-specific protective genes provides a unique opportunity to assess the magnitude of sociocultural factors on drinking behaviors, because its presence among Asians is supposed to suppress the development of alcoholism. When sociocultural factors facilitate drinking, it is conceivable that subtypes of alcoholics emerge who may not follow the patterns of the developmental pathway first involving behavioral problems and early substance use. In short, examining the developmental pathway from childhood conduct problem to alcohol use and abuse contrasting Western and Eastern societies might provide some preliminary
insights as to the impact of sociocultural factors and, potentially, the gene’s interaction with such factors in moderating or mediating developmental course.

Reflecting the common availability of alcohol worldwide, considerable research has accumulated in cross-cultural studies of alcoholism (Babor, 1992). However, systematic comparisons of rates of alcohol problems and alcoholism and demographic risk factors were first made available through the work of Helzer and his colleagues in a series of secondary analyses (Helzer, et al., 1990; Helzer & Canino, 1992). Mentioned in Chapter 4, his and his colleagues’ successful attempt owed in part to the fact that uniform diagnostic criteria symptoms based on the Diagnostic and Statistical Manual of Mental Disorders, Third Edition, (DSM-III) (American Psychiatric Association, 1980) were ascertained across many societies using the Diagnostic Interview Schedule (DIS) (Robins, Helzer et al., 1981). With this commonality of approach, the likelihood of observing cross-national differences that would have resulted solely from differences in assessment was greatly reduced. The present research, in fact, was inspired by this approach and attempts to expand it to a developmental perspective.

In this chapter, we continue to employ latent class analysis (LCA) and latent transition analysis (LTA) to assess cross-societal differences in transition rates from childhood conduct syndrome to alcohol use, and from alcohol use to alcohol abuse, as well as examining the patterns of endorsement and class structure of both alcohol use and alcoholism. A new feature of this chapter is the LTA application of a three-stage transition model. This allows examining transitions from childhood conduct syndrome to alcohol use and rates from use to abuse separately, according to the stages of the developmental model.

Measures
Childhood Conduct Syndrome

The measures used for conduct syndrome were the same as those used for examining the transitions from the childhood to adult form of antisocial personality behavior. Of the 12 childhood questions available from the DIS, 11 were used for the subsequent analyses: truancy, expulsion/suspension from school, arrest or being sent to juvenile court, running away, repeated lying, early drunkenness or drug use, stealing, vandalism, poor grades or underachievement, trouble at school, and trouble with starting fights. Inclusion of early alcohol or drug use could potentially confound its association with alcohol abuse. Because this measure was included in the examination of transitions from the childhood to adult forms of ASP, in line with the DSM-III criteria, we opted to include it in the examination of the pathway to alcohol and drug use and abuse. The contribution of this symptom to the classes of childhood conduct syndrome did not seem different from other measures; also, endorsement rates were relatively low across classes across the five societies. Therefore, the potential bias was considered to be negligible.

Alcohol Use and Abuse

Prevalence rates of all observed alcohol use and abuse measures used in the analyses of this chapter are listed separately for males and females in Table D.3 of Appendix D. Table 7.1 (upper section) shows the three items of alcohol use level: ever drank, 7+ drinks at least once a week for 2+ months, and thinking of oneself as an excessive drinker. The three endorsement items of alcohol use were chosen to provide sufficient variations in the measures of the alcohol use construct. They were intended to differentiate among nonusers, drinkers below a threshold, and those above a threshold without arbitrarily providing a threshold.

— Table 7.1. About Here —
Eight symptom criteria of alcohol dependence and/or abuse were derived from 24 alcohol problem questions, corresponding approximately to DSM-III symptom criteria. They are both shown in Table 7.1 (lower section). Drinking a “fifth” of liquor or 20+ drinks a day was one of the most common problems in males, and appeared to reflect a social dimension of male drinking. Therefore, this item was retained as an independent symptom criterion. Social and legal symptom criteria are combined in DSM-III, but they were separated in this paper to avoid ostensibly increasing prevalence of particular symptom criteria. Our prior empirical assessment of the diagnostic system of alcohol use disorders (Price, Robins, Helzer, & Cottler, 1998) was also consulted to aid in the decisions made about combining DIS questions to create alcohol symptom measures.

Analytic Strategies

Latent Transition Models

*Class selection:* Introduced in Chapter 5, LCA (McCutcheon, 1987) estimates endorsement and class probabilities simultaneously. In this chapter, LCA was first applied to select the proper number of classes separately for alcohol use levels and alcohol dependence/abuse syndrome for each country and by gender. Both the parsimonious and nested-model methods were considered in evaluating the LCA models; however the nested-model method was the primary means applied to decide the proper class structure.

*Three-stage model of childhood conduct syndrome to alcohol abuse:* Given the specification of the number of classes, latent transition analysis (LTA) additionally estimates the transition rate ($\hat{\pi}_{ij}$) from each class (status) at one stage to another class (status) at the next stage. Transition rates, class probabilities, and endorsement patterns were simultaneously estimated in WinLTA by means of the expectation-maximization (EM) algorithm, an iterative process used to maximize a log
likelihood function. The transition parameters were estimated separately for the models of transition from childhood ASP to alcohol use and those from alcohol use to alcohol abuse, as the combined models exceeded WinLTA’s current computing capacity. The transition parameters for non-alcohol users ($\hat{\alpha}_{ij2}$) were constrained as 1 or 0, as nonusers could not have developed alcohol problems. Missing cases were filled in automatically in the EM algorithm by applying the expected values to the missing cases in the first expectation step according to the parameters estimated by the given starting values. The number of parameters to be estimated increased in these models compared to the models examined in Chapter 6. Consequently, transition rates were estimated separately for each site and gender.

**Cross-Cultural Hypothesis Testing**

The cross-cultural hypothesis testing was performed by testing equality of transition rates ($\hat{\alpha}$) for selected sites using the WinLTA direct estimation method. Again, transition rates from childhood ASP to alcohol use ($\hat{\alpha}_{ij1}$) and those from alcohol use to alcohol abuse ($\hat{\alpha}_{kl2}$) were tested separately due to WinLTA’s current capability. As described in Chapter 5, testing was performed in two steps. In the first stage, a base score of the $-2 \log$ likelihood, $G^2$, was obtained for a specific combination of sites by estimating without constraining specific transition parameters ($\hat{\alpha}$) of interest. In the second step, $G^2$ was re-estimated with equality constraints placed on these transition parameters. The difference of the two $G^2$s were then compared to the degrees of freedom lost due to the restrictions on transition rates.

Because of the class selection results (see below) and the three-stage modeling, the number of combinations of transition rates that potentially could be tested for equality were much larger than the corresponding number for transition rates from childhood to adult forms of ASP. For this reason,
only selected transition rates of interest were tested for equality. In addition, some transition parameters were constrained to be zero when equality constraints were put on other parameters so as to avoid illogical consequences of the hypothesis testing. For example, when transition rates were estimated freely, the transition rates from high alcohol users to the nonaffected class of alcohol abuse were naturally zero across five sites. Similarly, transitions from “light” drinking to the most severe form of alcoholism were naturally zero. However, when equality constraints were placed on other parameters for cross-cultural hypothesis testing, the transition rated on these cells became positive, which was judged to be artificial. Thus WinLTA was rerun with the additional constraint placed on these cells in estimation.

Results

Selection of Latent Classes

*Childhood conduct syndrome:* As reported in Chapter 6, the 3-class solution was appropriate for all models except for Taiwan females (See Table 6.3, upper section.). The Eastern countries showed some small “pathological” classes: the probability of Class 3 is .005 for Korean females and .002 for Taiwan females (rounded to 0% in Figure 6.1). These classes may not correspond to the most severe classes in the three Western societies. However, for the purpose of transition rate comparison, the 3-class solution was considered the most optimal across five sites and two genders.

*Alcohol use:* Results for the classes of alcohol use obtained from three items are shown in Table 7.2 (upper portion). Given the nature of the questions that addressed different levels of drinking, it is not surprising to find clear-cut results supporting the 3-class solution that presumably correspond to no drinking, some drinking, and heavy drinking. In fact, in some cases, three classes were the maximum number possible. The reduction in $G^2$ from the 2-class to 3-class solution was much larger
than the cutoff $\chi^2$ score both for males and females, except for Taiwan females, where the $G^2$ reduction was 9, only slightly larger than the $\chi^2$ cutoff score of 7.8.

— Table 7.2. About Here —

*Alcohol abuse:* The 3-class solution was again better than the 2-class solution, judging from the large reductions in $G^2$ (Table 7.3, lower portion). However, the large values of $G^2$ that could still be reduced with the 3-class solution suggested the possibility for a 4-class solution being more appropriate for some sites. Nonetheless, the 3-class solution was judged optimal for two reasons: The four-class solution begins to produce subtypes, but are not clear-cut (not shown). Also, 12 transition rates would have complicated interpretations of cross-cultural differences, and artificial zero transitions due to nonexistence of the fourth class, or the pathological fourth class in some countries or gender, would have produced artificial cross-cultural differences.

**Class Structure and Endorsement Patterns**

*Alcohol use:* Shown in Figure 7.1, the class probability for nonusers (Class 1) differed considerably across sites and gender. This class comprised 10% among U.S. males (Figure 7.1, top left figure), compared to 91% among Taiwan females (Figure 7.1. bottom right figure). Conversely, Class 3, which is the class representing drinkers beyond a threshold of minor drinking, contained 26% among U.S. males, compared to 1% among Taiwan females. Drinkers of Class 3 were more likely to acknowledge themselves as excessive drinkers than to endorse the objective question of 7+ drinks in the two Eastern societies in both males and females, while the pattern was the reverse for both males and females in the three Western societies. This indicates that the standard of excessive drinking differs between the West and the East even among drinkers who drink more than a light amount.
Symptoms of alcohol dependence or abuse: Given that the 3-class solution was applied to all five sites, classes reflected differences in severity (or levels) of alcohol problems. At this level of complexity in class structure, subtypes were not found. Figure 7.2 shows class probabilities and endorsement patterns of symptoms listed in DSM-III across five sites separately for males and females. Class 3, the severest group of alcohol abusers, comprised 48% among South Korean males, compared to 10% among Taiwan males. The class probabilities for males in the three Western countries fell in between. This is one of the most noticeable differences compared to the male patterns of adult form of ASP. Among females, the probabilities for Class 3 were a fraction of those among males. This gender difference was more noticeable than cross-national differences.

The endorsement patterns of alcohol dependence/abuse symptoms were almost identical among men in the three Western sites. In women, while the patterns differed from those for men, they were very similar across the three Western sites. Three symptoms, drinking large quantity, pathological drinking, and social problems, were endorsed most frequently among those in Class 3, the severest group, across five countries and across males and females. However, relative to the level of endorsement of quantity and pathological drinking, social problems were endorsed more commonly among Taiwan males and females, as well as among South Korean females.

Latent Transition Estimates

Results of WinLTA estimation of latent transition rates are shown in Table 7.3. Transition rates were re-estimated with additional constraints based on earlier estimates of these transition rates, so that the transition rates shown here are the same transition rates for which equality constraints were
placed for the cross-cultural hypothesis testing. Fixed transition parameters involved those from alcohol use to abuse. The transition rate from Class 3 of alcohol use to Class 1 of alcohol abuse (\( \hat{\lambda}_{312} \)) and the rate from Class 2 of alcohol use to Class 3 of alcohol abuse (\( \hat{\lambda}_{232} \)) were constrained to be 0. These constraints avoided the parameters to become positive, which would have occurred without the constraints when the equality constraints were added to test the cross-cultural hypotheses.

— Table 7.3. About Here —

**Transition rates in men:** The estimates of the 3X3 transition rates in men are shown in Table 7.4 (left two columns). The estimates obtained from WinLTA, by and large, conformed to our expectations; the more severe the conduct syndrome, the higher the probability of drinking and drinking more than lightly. The movement from the mild childhood ASP class (C\(_2\)), nevertheless, was variant across five international sites. If the 3-class solution is valid across the five sites, this observation indicates a lack of predictive value of mild conduct problems to the level of drinking.

As for the transition from alcohol use to alcohol abuse, only transition from the mild drinking and high drinking classes are of interest, since other movements from the non-drinking class was constrained. In general, the transition rates from the high drinking class to the severe class of alcohol abuse was higher than to the mild class of alcohol abuse. However, it appeared that this tendency was much less clear among Canadian and New Zealand males.

**Transition rates in women:** As shown in Table 7.3 (right two columns), the transition rates from childhood ASP to alcohol use in women did not conform to the expected pattern as much as they did in men. The estimates of transition rates from severe childhood ASP (C\(_3\)) in two the Eastern sites may have been unstable due to their very low class probabilities. Unfortunately, standard errors to assess confidence intervals are not easily obtained in WinLTA. As for the transition from alcohol
use to alcohol abuse among females, most mild drinkers (C2) stayed alcohol problem free in Canada (90%), New Zealand (92%), and South Korea (78%).

Cross-Cultural Hypothesis Testing for Transition Rates

There were 26 (2^5 - 6) combinations of two or more countries, 57 (2^6 - 7) combinations of two or more transition parameters from childhood conduct syndrome to alcohol use level (because the third parameter is (1- ð_{ij})) and 9 (2^4 - 5) combinations of two or more transition parameters from alcohol use level to alcohol dependence/abuse syndrome (because 5 parameters were constrained). We examined only several combinations of transitions that were worthwhile from our cross-cultural viewpoint. They consisted of the ð_{ij} parameters related to the mild ASP class (childhood ASP C2 row) and to the high drinking class (alcohol use C3 column), and the ð_{kl} parameters related to the mild drinking group (alcohol use C2 row) and to the high drinking group (alcohol use C3 row). These transition parameters are shown in “X”s in square tables for each hypothesis testing listed in Table 7.4 and Table 7.5 (middle columns).

--- Table 7.4. About Here ---

**Cross-site differences in men:** Shown in Table 7.4, for the transition rates from childhood ASP to alcohol use among males, the West-East dichotomy does not appropriately characterize the observed patterns, as the rates were sufficiently different between South Korea and Taiwan. When the differences of transition to heavy drinking were examined, those for South Korea and Taiwan were contrasted to the three Western sites (United States, Canada, and New Zealand); also, South Korea’s contrasted with Taiwan’s (third, fourth, and sixth rows). Tests yielding the results for comparisons of the transition rates in question from each contrasting combinations of sites were significantly different (p < .001). This indicates that South Korean males’ patterns of transition to
high drinking level from levels of conduct problems were different from those of the three Western sites and from those of Taiwan males. However, the data did not support cross culturally divergent paths to alcohol use for children with mild childhood ASP. It continued to appear that the South Korean male pattern was different from males in the three Western sites (first, second and fifth rows).

Moving to the transition rates from alcohol use level to alcohol dependence/abuse syndrome, New Zealand males were found to be different from males in other societies (first and second rows). For the transition rates concerning light drinking to alcohol dependence/abuse syndrome, differences between U.S. and South Korean males were detected ($p = .008$); differences appeared negligible for the transition rates from high level of drinking to the mild and severe classes of alcohol dependence/abuse syndrome (third and fourth rows).

*Cross-site differences in women*: Table 7.5 shows the corresponding results for females. Some gender differences were observed. We did not find cross-cultural divergence in drinking patterns among the mild childhood ASP group in women. Unlike the patterns for males, the transition rates to the high drinking class showed a clear West-East dichotomy, since the patterns for South Korean and Taiwan females were very similar. New Zealand’s unique transition pattern from alcohol use to alcohol abuse was replicated in the its female sample as well.

— Table 7.5. About Here —

**Summary Findings**

As expected, patterns of transition from childhood conduct syndrome to alcohol use to abuse were more variant across the international sites examined here than those to adult form of antisocial personality.
**Class structure and endorsement patterns:** Employing the nested-model method, the 3-class solution was judged most appropriate for the subsequent transition analyses. The third class, however, may not represent the most severe category of alcoholism among South Korea and Taiwan females. The endorsement patterns for alcohol use level and alcohol dependence/abuse syndrome were found to be similar across gender and international sites. A few notable differences were revealed. Excessive drinking was more readily endorsed in the two Eastern than in the Western societies among those who drank more than a minor amount. Social problems were more commonly endorsed in Eastern than Western countries among those in the severe class of alcoholism, compared to other symptoms.

**Transition rates:** In general, the more severe the conduct syndrome, the higher the probability of starting to drink. However, the transition from mild childhood ASP was variant across five sites. Not surprisingly, the transition rate from the high drinking class was highest in the severest abuse class; however, this rate was .29 among males and .27 among females in New Zealand, compared to .90 among males and .94 among females in U.S.A.

**Cross-cultural differences:** The data did not support cross culturally divergent paths to alcohol use for children with mild childhood ASP. The West-East dichotomy, found for the transition from childhood to adult ASP in Chapter 6, was not replicated for the transition from childhood ASP to alcohol use level in males. Rather, South Korea and Taiwan differed from each other, and in turn each was different from the three Western societies. U.S. and South Korean male drinkers appear to be similar, supporting Korean perceptions of similarities between drinking patterns in their country and in the West. Surprisingly, New Zealand was found to be different from other societies with respect to the transition from alcohol use to alcoholism, indicating the existence of some unique
factors protecting New Zealand drinkers from becoming severe alcoholics, although there are a number of alternative explanations. Such findings would not be expected from earlier results using the same survey (Wells, Bushnell, Hornblow, Joyce, & Oakley-Browne, 1992; Wells, Bushnell, & Oakley-Browne, 1995); further examination therefore is warranted.

**Gender differences:** Among females, the majority of mild drinkers stayed alcohol-problem free, except in Taiwan. The transition from the three levels of childhood ASP to the high drinking class showed a clear West-East dichotomy because South Korean and Taiwan females were very similar. The dichotomy was clearer than it was among males, because Korean males’ patterns of alcohol use and alcoholism, as well as state transitions, resembled those of U.S. males.

Overall, gender differences in class probabilities, transition patterns, in combination with cross-societal differences in class probabilities, endorsement patterns, and transition rates, suggest that a substantial impact of sociocultural factors exists despite the fact that the low prevalence of alcoholism observed for Taiwan females and males as well as for South Korean females could be attributable to their alcohol sensitivity due to ALDH2 deficiency in Asians. Gender differences between South Korean’s males and females are difficult to explain by genetic differences alone unless alcohol sensitivity genes somehow interact with sex-specific genes for expression.
Table 7.1. Alcohol Use and Symptom Measures

<table>
<thead>
<tr>
<th>Alcohol use:</th>
<th>Ever drank enough to get drunk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7+ drinks once a week for 2+ months</td>
</tr>
<tr>
<td></td>
<td>Thought to be excessive drinker</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alcohol symptom criteria:</th>
<th>Dependence</th>
<th>Large quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Need to drink in the morning</td>
<td>• 20+ drinks per day</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Withdrawal</th>
<th>Pathological drinking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Shakes, fits/seizures</td>
<td>• 7+ drinks/day for 2+ weeks</td>
</tr>
<tr>
<td></td>
<td>• Delirium tremors</td>
<td>• Binges or benders</td>
</tr>
<tr>
<td></td>
<td>• Seen or heard things</td>
<td>• Blackouts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Health problems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Tried to stop but couldn’t</td>
<td>• Liver disease</td>
</tr>
<tr>
<td></td>
<td>• Tried to control drinking</td>
<td>• Vomiting blood</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Tingling or numbness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Memory trouble</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pancreatitis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Continued to drink despite physical illness</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Social problems</th>
<th>Legal problems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Family objected</td>
<td>• Trouble driving</td>
</tr>
<tr>
<td></td>
<td>• Friend told drinking too much</td>
<td>• Arrested</td>
</tr>
<tr>
<td></td>
<td>• Job/school trouble</td>
<td>• Fights</td>
</tr>
<tr>
<td></td>
<td>• Neglected responsibilities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Couldn’t work without a drink</td>
<td></td>
</tr>
</tbody>
</table>

*aSymptom criteria correspond to DSM-III except “large quantity” was retained as a separate criterion because of high prevalence rates, and social/legal problems were separated into two criteria because of the availability of several questions.*
Table 7.2. Latent Class Selection Using WinLTA

<table>
<thead>
<tr>
<th>Site</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>G2 for 2 classes</td>
<td>G2 reduction from 2 to 3 classes</td>
</tr>
<tr>
<td>St. Louis, U.S.A.</td>
<td>137</td>
<td>128</td>
</tr>
<tr>
<td>Edmonton, Canada</td>
<td>234</td>
<td>234&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Christchurch, New Zealand</td>
<td>88</td>
<td>68</td>
</tr>
<tr>
<td>South Korea</td>
<td>480</td>
<td>460</td>
</tr>
<tr>
<td>Taiwan</td>
<td>157</td>
<td>148</td>
</tr>
<tr>
<td>Degrees of freedom (d.f.)</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Cutoff Δ&lt;sup&gt;2&lt;/sup&gt;&lt;sup&gt;b&lt;/sup&gt;</td>
<td>9.5</td>
<td>7.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site</th>
<th>Alcohol use</th>
<th>Alcohol use to alcohol abuse</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>G2 for 2 classes</td>
<td>G2 reduction from 2 to 3 classes</td>
</tr>
<tr>
<td>St. Louis, U.S.A.</td>
<td>1,089</td>
<td>503</td>
</tr>
<tr>
<td>Edmonton, Canada</td>
<td>1,236</td>
<td>688</td>
</tr>
<tr>
<td>Christchurch, New Zealand</td>
<td>428</td>
<td>201</td>
</tr>
<tr>
<td>South Korea</td>
<td>2,934</td>
<td>1,370</td>
</tr>
<tr>
<td>Taiwan</td>
<td>3,126</td>
<td>612</td>
</tr>
<tr>
<td>Degrees of freedom (d.f.)</td>
<td>246</td>
<td>9</td>
</tr>
<tr>
<td>Cutoff Δ&lt;sup&gt;2&lt;/sup&gt;&lt;sup&gt;c&lt;/sup&gt;</td>
<td>284</td>
<td>17</td>
</tr>
</tbody>
</table>

Note. The number of classes (statuses) for each stage was chosen separately, based on evaluation of the reduction in G², relative to the degrees of freedom. The difference of G²'s takes the Δ<sup>2</sup> distribution, for which a cutoff value was obtained.

<sup>a</sup>Five free parameters with five response patterns due to missing values, therefore G² = 0 for the 3 class solutions. <sup>b</sup>Δ<sup>2</sup> value for d.f. = 3 to choose between 2 and 3 classes, p #.05. <sup>c</sup>Δ<sup>2</sup> value for d.f. = 9 to choose between 2 and 3 classes, p #.05.
Table 7.3. Transition Rates from Childhood ASP to Alcohol Use and from Alcohol Use to Alcohol Abuse

<table>
<thead>
<tr>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Childhood ASP to Alc Use ($\hat{\alpha}_{ij1}$)</td>
<td>Alc Use to Abuse ($\hat{\lambda}_{kl2}$)$^a$</td>
</tr>
<tr>
<td>C1</td>
<td>C2</td>
</tr>
<tr>
<td>C1</td>
<td>.14</td>
</tr>
<tr>
<td>C2</td>
<td>.03</td>
</tr>
<tr>
<td>C3</td>
<td>0</td>
</tr>
<tr>
<td>C1</td>
<td>.17</td>
</tr>
<tr>
<td>C2</td>
<td>.01</td>
</tr>
<tr>
<td>C3</td>
<td>0</td>
</tr>
<tr>
<td>C1</td>
<td>.13</td>
</tr>
<tr>
<td>C2</td>
<td>.04</td>
</tr>
<tr>
<td>C3</td>
<td>.03</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>C2</td>
</tr>
<tr>
<td>C1</td>
<td>.25</td>
</tr>
<tr>
<td>C2</td>
<td>.10</td>
</tr>
<tr>
<td>C3</td>
<td>.08</td>
</tr>
<tr>
<td>C1</td>
<td>.57</td>
</tr>
<tr>
<td>C2</td>
<td>.13</td>
</tr>
<tr>
<td>C3</td>
<td>.21</td>
</tr>
</tbody>
</table>

Note. Transition rates $\hat{\alpha}_{ij1}$ and $\hat{\lambda}_{kl2}$ were estimated separately for each site and transition period ($\hat{\alpha}_1$ and $\hat{\lambda}_1$). $\hat{\alpha}$ from C2 to C3 were constrained.

$^a$From alcohol use to alcoholism, Class 1 transition rates were constrained $\hat{\alpha}_{112} = 1$, $\hat{\alpha}_{122} = \hat{\alpha}_{132} = 0$. 

-103-
Table 7.4. Cross-Cultural Hypotheses Testing for Transition Rates Among Males

<table>
<thead>
<tr>
<th>Transition from childhood conduct problems to alcohol abuse</th>
<th>$\hat{\theta}_{ij}$</th>
<th>$L^2$</th>
<th>d.f.</th>
<th>p</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western sites versus South Korea</td>
<td>12.3</td>
<td>2</td>
<td>.002</td>
<td>5,119</td>
<td></td>
</tr>
<tr>
<td>Western sites versus Taiwan</td>
<td>2.6</td>
<td>2</td>
<td>.227</td>
<td>7,785</td>
<td></td>
</tr>
<tr>
<td>Western sites versus South Korea</td>
<td>32.8</td>
<td>3</td>
<td>&lt;.001</td>
<td>5,119</td>
<td></td>
</tr>
<tr>
<td>Western sites versus Taiwan</td>
<td>32.9</td>
<td>3</td>
<td>&lt;.001</td>
<td>7,785</td>
<td></td>
</tr>
<tr>
<td>South Korea versus Taiwan</td>
<td>0.4</td>
<td>2</td>
<td>.817</td>
<td>7,546</td>
<td></td>
</tr>
<tr>
<td>South Korea versus Taiwan</td>
<td>35.4</td>
<td>3</td>
<td>&lt;.001</td>
<td>7,546</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transition from alcohol use to alcohol abuse</th>
<th>$L^2$</th>
<th>d.f.</th>
<th>p</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.A., Canada, South Korea, and Taiwan versus New Zealand</td>
<td>45.1</td>
<td>2$^a$</td>
<td>&lt;.001</td>
<td>10,225</td>
</tr>
<tr>
<td>U.S.A., Canada, South Korea, and Taiwan versus New Zealand</td>
<td>70.5</td>
<td>2$^a$</td>
<td>&lt;.001</td>
<td>10,225</td>
</tr>
<tr>
<td>U.S.A. versus South Korea</td>
<td>9.7</td>
<td>2$^a$</td>
<td>.008</td>
<td>3,410</td>
</tr>
<tr>
<td>U.S.A. versus South Korea</td>
<td>4.2</td>
<td>2$^a$</td>
<td>.122</td>
<td>3,410</td>
</tr>
</tbody>
</table>

Note. The $L^2(-2 \text{ log likelihood})/2$ score is the increase in $G^2$ when the transition rates ($\hat{\theta}_{ij}$) were constrained to be equal, compared to $G^2$ when the transition rates were free parameters. d.f.: degrees of freedom.

$^a$d.f. = 2 were reclaimed: one for constraining 2 $\hat{\theta}$’s, the other constraining the third $\hat{\theta} = 0$. 

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Table 7.5. Cross-Cultural Hypotheses Testing for Transition Rates Among Females

<table>
<thead>
<tr>
<th>Transition from childhood conduct problems to alcohol abuse</th>
<th>$\hat{\alpha}<em>{ij} \times \hat{\beta}</em>{ij}$</th>
<th>$L^2$</th>
<th>d.f.</th>
<th>p</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western sites versus Eastern sites</td>
<td></td>
<td>3.6</td>
<td>2</td>
<td>.170</td>
<td>11,600</td>
</tr>
<tr>
<td>Western sites versus Eastern sites</td>
<td></td>
<td>35.5</td>
<td>3</td>
<td>&lt;.001</td>
<td>11,600</td>
</tr>
<tr>
<td>South Korea versus Taiwan</td>
<td></td>
<td>2.7</td>
<td>2</td>
<td>.264</td>
<td>7,488</td>
</tr>
<tr>
<td>South Korea versus Taiwan</td>
<td></td>
<td>3.2</td>
<td>3</td>
<td>.356</td>
<td>7,488</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transition from alcohol use to alcohol abuse</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.A., Canada, South Korea, and Taiwan versus New Zealand</td>
<td></td>
<td>19.1</td>
<td>2</td>
<td>&lt;0.001</td>
<td>11,600</td>
</tr>
<tr>
<td>U.S.A., Canada, South Korea, versus New Zealand</td>
<td></td>
<td>23.9</td>
<td>2</td>
<td>&lt;0.001</td>
<td>6,718</td>
</tr>
</tbody>
</table>

Note. The $L^2$ (−2 log likelihood) $\chi^2$ score is the increase in $G^2$ when the transition rates ($\hat{\alpha}_{ij}$) were constrained to be equal, compared to $G^2$ when the transition rates were free parameters. d.f.: degrees of freedom.

*a* d.f. = 2 were reclaimed: one for constraining 2 $\hat{\alpha}$'s, the other constraining the third $\hat{\beta} = 0$.

*b* Taiwan females were dropped because of the extreme low cell probability of (alcohol use C3, alcohol abuse C3).
Figure 7.1. Endorsement Patterns of Alcohol Use

Male

St. Louis, U.S.A.

Edmonton, Canada

Christchurch, New Zealand

South Korea

Taiwan

Female

St. Louis, U.S.A.

Edmonton, Canada

Christchurch, New Zealand

South Korea

Taiwan

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Figure 7.2. Endorsement Patterns of Alcohol Dependence/Abuse Symptoms
Chapter 8.

Transitions from Childhood Antisocial Behavior to Drug Use and Abuse

It is a relatively recent notion outside those engaged in substance abuse research that the twin evils of substance abuse, alcoholism and abuse of illicit drugs, share many common etiological or risk factors. One such common risk factor is, as introduced in Chapter 2, the childhood form of antisocial personality. Chapter 8 examines the developmental association of childhood conduct syndrome to drug abuse, which is the last of the three constructs we set forth to examine in the cross-national context.

Introduced already, there is ample evidence in the United States that children with behavioral and conduct problems are particularly at risk for developing drug and alcohol use (Kandel, Simchafa-Fagan, & Davies, 1986; Robins, 1966), and also for progression from legal to illicit drugs (Yamaguchi & Kandel, 1984). We have confirmed these earlier findings from the U.S. ECA Project (Price, 1991; Robins & Price, 1991).

Reports from epidemiologic studies outside the United States suggest that such a developmental association is not unique to this country. A report from Ontario, Canada (Boyle et al., 1992) confirmed the independent contribution of conduct disorder to predict marijuana use. Early problem behaviors were found to distinguish heroin addicts from controls in Pakistan (Gillis, Tareen, Chaudhry, & Haider, 1994). Japanese epidemiologic studies also suggested that solvent abusers in Japan, who often become methamphetamine abusers later (Fukui, Wada, & Iyo, 1994; Fukui, Wada,
have a high likelihood of association with juvenile delinquents even before their first solvent use, and have an increased association with criminals after their first use (Wada & Fukui, 1994). Similar associations are reported on behavioral correlates of adolescent inhalant abuse from other Asian countries, elsewhere in the Pacific Region (Kin & Navaratnam, 1995), and South America (Baldivieso, 1995). Nonetheless, these reports do not have a good comparative basis: childhood measures, as well as the definition of drug use and abuse, differed from one study to another. Thus, although these studies suggest that this developmental association may be commonly observed in many parts of the world where illicit drug use exists at all, it is not clear how strong such an association is across societies and why it may be well correlated in one society but not in another.

Another disjuncture relates to the lack of drug use measures in well-known studies of children’s behavior problems. A number of epidemiologic studies in childhood behavioral problems assessed with well-validated measures have been conducted in other Western societies (Davie, Butler, & Goldstein, 1972; Rutter, Tizard, & Whitmore, 1970; Connell, Irvine, & Rodney, 1982; McGee, Silva, & Williams, 1984, and in non-Western societies (Van den Oord, Boomsma, & Verhulst, 1994; Matsuura et al., 1989; Matsuura et al., 1993), but they did not include drug use outcome measures.

Indeed, because drug use and abuse until recently was an alien scientific or public health concept outside North America and Europe, systematic cross-national research has been rare on illicit drug abuse in general. What currently exists in place includes rapid epidemiologic monitoring of international drug use trends (Community Epidemiology Work Group, 1998), and monitoring of international drug trafficking (Office of National Drug Control Policy, 1998). Recently, the situation is improving rapidly. National surveys have been conducted in many countries outside North
America and Europe, including Guatemala (Bolivar-Diaz & Delva, 1999), Chile (Caris & Anthony, 1999), Mexico, Brazil (Borges et al., 1999), and Japan (Wada, Price, & Fukui, 1997), among others, which are modeled after the existing national surveys in the United States such as the National Household Survey of Drug Abuse (SAMHSA, 1998), Monitoring the Future (Johnston, O'Malley, & Bachman, 1999), and the National Comorbidity Study (Kessler et al., 1994; Warner, Kessler, Hughes, Anthony, & Nelson, 1995). Because these datasets include common protocols, it would be possible to take a pooled cross-national analyses approach similar to the one carried out in this monograph (e.g., (Borges et al., 1999)). Etiological or developmental risk factor analysis can be carried out (Caris & Anthony, 2000) that can be extended to cross-national comparisons.

Until these studies are utilized, the current study appears to be one of the few, if any, that allows systematic examination of the pathway from childhood conduct syndrome to drug use and abuse in an international setting. The analysis strategy used in this chapter is very similar to that in previous chapters. We employ the latent class analysis to compare transition rates, as well as class probabilities and endorsement patterns. Several modifications were necessary, however, because drug questions were asked in different way from that used for alcohol questions in the DIS. Instead of estimating parameters based on a three-stage model, as was done in Chapter 7, we estimated two two-stage models separately: one for childhood conduct syndrome to drug use; and the other childhood conduct syndrome to drug abuse. Cross-cultural hypotheses testing is carried out in these contexts.

**Measures**

**Childhood Conduct Syndrome**

The measures used for conduct syndrome were the same as those used for examining the
transitions from the childhood to adult form of antisocial personality behavior in Chapter 6, and the transitions to alcohol use in Chapter 7. Of the 12 childhood questions available from the DIS, 11 were used for the subsequent analyses: truancy, expulsion/suspension from school, arrest or being sent to juvenile court, running away, repeated lying, early drunkenness or drug use, stealing, vandalism, poor grade or underachievement, trouble at school, and trouble with starting fights. Inclusion of early alcohol or drug use could potentially confound its association to drug abuse. Because this measure was included in the examination of childhood to adult forms of ASP, in line with the DSM-III criteria, we opted to include it in the examination of the pathway to alcohol and drug use and abuse. The contribution of this symptom to the classes of childhood conduct syndrome did not seem different from other measures and, also, endorsement rates were relatively low across classes across the five societies. Therefore, the potential bias was considered to be negligible.

**Drug Use and Abuse**

The prevalence rates of all measures of drug use and symptoms of drug dependence or abuse used in the analyses described in this chapter, are listed separately for males and females in Table D.4 of Appendix D. Unlike the measures available to construct the latent classes (statuses) of alcohol use level, the number of available questions relating to drug use were too small to construct a reasonable latent construct of the “drug use” stage with sufficient variations in the resulting cells. The “drug use” stage instead was constructed to be a single scale variable of three categories consisting of no use, any use, or five or more times. This measure was then considered as an observed construct, instead of a latent construct.

For measures of drug abuse, eight symptom criteria meeting the DSM-III drug dependence or abuse were based on eight gateway questions covering “any drug” used for illicit purposes and
subsequent questions for each of the nine types of drugs (marijuana, stimulants, sedatives, tranquilizers, cocaine, heroin, other opiates, psychedelics, and other drugs). A positive response to “any drug” asked in the gateway question or to any of these types of drugs resulted in a positive endorsement of that symptom. Some respondents answered questions on specific types of drugs even despite having denied or not answered the symptom when asked for “any drug,” although this occurred rarely. The eight symptom criteria measures were somewhat different from those included for alcohol dependence and abuse in Chapter 6. They included inability to cut down or quit, emotional or psychological problems as consequence, physical health problems, everyday use for 2+ weeks, dependence, family, social, occupational or legal problems, tolerance and withdrawal and are listed in Table 8.1.

— Table 8.1. About Here —

Analytic Strategies

Classes and Transition Models

Class selection: The class selection procedure and results for childhood conduct syndrome were presented in Chapter 6. Drug use level was measured as a single scale variable, so the three categories were considered as three observed “classes.” For the symptoms of drug dependence or abuse, latent classes were estimated for the subset of the sample who reported use of a specific type of drugs five times or more. If it were possible to include the entire sample; however, estimates would have been unstable even if conversion were reached, due to very low endorsement rates by gender in some countries. Restricting our estimates to those with a history of use five times or more also avoided computing a very large class of nonusers.

Transition rates: Transition analyses were carried out separately for childhood conduct
syndrome to drug use, and childhood conduct syndrome to the drug abuse construct. For the first part, LCA rather than LTA, was used in WinLTA to compute the transition rates from childhood conduct syndrome to drug use to handle the observed measure of drug use level. LCA probabilities were computed by constraining a model to consist of nine classes; the three childhood conduct syndrome classes were estimated for each of the three levels of drug use. The probabilities of each endorsement symptom of ASP across the three levels of drug use were constrained to be identical for each of the three classes of childhood conduct syndrome; but the latent class probabilities were allowed to vary. With the estimated latent class probabilities for all nine classes, it was possible to compute the transition rate from the childhood classes to the observed drug use level.

This strategy was considered to yield more accurate estimates of transition rates than those that could have been obtained by the LCA class assignment method employed in Chapter 6. Recall that transition rates estimated by the MLLSA class assignment method yielded less clear patterns of transition from childhood conduct syndrome to adult ASP than did the transitions estimated by the WinLTA direct estimation method. Although other plausible reasons exist, one factor for the discrepancies between the class assignment method and direct estimation method is the use of modal probabilities in the class assignment. The latter method necessarily results in the loss of information by assigning discrete classes to continuous probabilities.

In computing transition rates using the 9-class solution, very low endorsement rates for both the severest class (Class 3) of the childhood conduct syndrome and the 5+ times use category were still problematic in the Eastern sites. As a result, two childhood classes were used for Korean males and females and Taiwan males; in other words, the 6-class solution was used. For Taiwan females, two childhood classes and two observed drug use states were used, using the 4-class solution.
For the second part, LTA was used to compute the latent transitions from the three childhood conduct syndrome classes to two classes of the drug abuse construct based on the symptoms of drug dependence or abuse, using the entire sample. This set of analyses was carried out in the same manner as the LTA estimation of other transition rates described in Chapters 6 and 7. As before, missing cases were filled in as part of the EM algorithm steps. Unlike the procedure to estimate the transition rates from alcohol use to alcoholism, no constraints were placed on any transition rates, because transitions did not involve any use statuses.

**Cross-Cultural Hypothesis Testing**

*Transition rates*: Hypothesis testing for the transition rates from the childhood conduct syndrome to drug use was not performed, as transition rates were obtained in an ad-hoc fashion using class probabilities. The cross-cultural hypothesis testing for the transition rates from childhood ASP to the symptoms of drug dependence or abuse was performed by testing equality of transition rates for selected sites. Testing was performed in two steps in the same manner as that described in Chapter 5 through Chapter 7. Hypothesis testing for this part was more straightforward than that performed in Chapter 6 and Chapter 7, because all sites were included in testing site differences here, while specific combinations of sites had to be used for equality constraints in earlier analyses of transitions to adult ASP and transitions to alcohol use and alcoholism.

*Endorsement rates*: Additionally, the differences among endorsement rates of the symptoms of drug dependence or abuse were tested. This set of analyses was carried out only for endorsement patterns of drug symptoms, because visual inspection indicated that endorsement patterns were more different over multiple symptoms of drug dependence or abuse across international sites than they were for symptoms of alcoholism. The testing procedure was carried out using LCA in WinLTA in
a manner similar to testing transition rates. In the first step, a base $G^2$ was obtained for the sites to be tested without constraining the endorsement parameters. In the second step, $G^2$ was re-estimated with equality constraints placed on the corresponding endorsement parameters across selected sites, while endorsement rates within sites were allowed to vary. The difference of the two $G^2$s was then compared to the degrees of freedom lost due to the restrictions on endorsement rates.

**Sample Inclusion**

For both transitions from childhood conduct syndrome to drug use level and from childhood conduct syndrome to symptoms of drug dependence or abuse, all respondents were included, irrespective of their drug use level. Parameters were estimated separately for males and females and for each international site in estimating transition rates from childhood conduct syndrome to drug use. Estimation of transition parameters from childhood conduct syndrome to symptoms of drug dependence or abuse was carried out to obtain transition rates for each gender and each international site, but using gender-separated site-combined datasets, in consideration for the subsequent cross-cultural hypothesis testing.

Symptoms of drug dependence and abuse were assessed only for the subsample of respondents at each international site who reported using an illicit drug five or more times. The percentages for 5+ times users varied from 0.8% in Taiwan to 38.9% in Canada among males, and from 0.5% in Taiwan to 21.4% in U.S. females (See Table D.4.). Therefore, effective sample sizes varied corresponding to the prevalence rates of 5+ times users in estimating class probabilities and endorsement probabilities and in performing cross-cultural hypothesis testing of endorsement patterns. Again, in consideration for hypothesis testing, these parameters were estimated from gender-separated site-combined datasets.
Results

Class Selection

As noted earlier, for the purpose of transition rate comparison, the 3-class solution was considered the most optimal for childhood conduct syndrome across five sites and two genders, although the 2-class solution might have been a better model for Taiwan females. Three observed “classes” have been chosen a priori to represent the drug use level. The 2-class solution was the only reasonable option for drug abuse symptoms, because rates of endorsing some symptoms were so low. Higher class solutions lead to aberrant classes being created in some countries, especially among females.

Symptoms of Drug Dependence or Abuse

Class and endorsement probabilities were estimated from the symptoms of drug dependence or abuse across the five sites, limited to the subsample of 5+ times users, as mentioned. Class probabilities and endorsement patterns are presented in Figure 8.1. When limited to the 5+ times users, the probabilities of the affected class (Class 2) varied from 17% (United States and South Korea) to 30% (Taiwan) among men, and from 13% (Taiwan) to 25% (South Korea) among women. Although these ranges represent considerable variation, there does not appear to be a systematic trend across international sites and gender. In fact, that Taiwan showed two the extreme rates (the highest at 30% in men and the lowest at 13% in women) is likely to be due to very low numbers of 5+ times users either in men (n = 44) or in women (n = 26) despite the large sample sizes ascertained at these sites. In general, at least 70% of respondents with a history of 5+ times drug use did not appear to become afflicted with drug dependence or abuse in a lifetime framework.
Endorsement patterns differed between the three Western countries and two Eastern countries. The patterns were very similar among the United States, Canada, and New Zealand both for males and females. Contrasting to the patterns of symptom endorsement in Western countries, the rates were noticeably lower for emotional and psychological consequences of drug use and social/legal/occupational consequences of drug use in the affected classes in the two Eastern countries. It is not clear if these differences are a fluke, due to low prevalence in the two Eastern countries, or represent actual differences in symptom patterns.

Transition Rates

Transition from childhood ASP to drug use: Transition rates recomputed from the results derived from the 9-class solution combining three childhood conduct syndrome classes and the three levels of drug use are shown in Table 8.2. The transition rates displayed a typical dose-response pattern with the more severe levels of childhood conduct syndrome yielding higher transition rates to the category of five time or more use. The transition rates were similar between males and females of each country, even though the prevalence rates of drug use and drug use five times or more were substantially higher in men than in women in all countries except South Korea. The three Western sites showed much higher transition rates than the two Eastern sites from the mid and severe classes of childhood conduct syndrome into the 5+ times drug use category. However, this comparison is somewhat dubious due to the 2-class solution used for childhood conduct syndrome in the two Eastern sites. Also worth noting is that, for Western sites, the transition rate to “any use” was lower than the transition rate to “five or more times,” while for Eastern sites the opposite seemed to hold.

— Table 8.2. About Here —

Transition from childhood ASP to drug abuse: Results of estimation of transition rates carried
out in WinLTA are shown in Table 8.3. For South Korean and Taiwan females, the class probabilities for the affected classes were near zero (.008 for South Korean females and .002 for Taiwan females), so that transition rates were uninformative. Consequently, we omitted presentation of transition rates for these categories. The patterns of transition rates were similar to those observed for the transition rates from childhood conduct syndrome to drug use across both countries and genders: the higher the levels of childhood conduct syndrome, the higher the transition rates to the affected class based on symptoms of drug dependence or abuse. Also noticeable in patterns among males is that transition from the mild class of childhood conduct syndrome to drug problems was much lower for South Korea (.01) and Taiwan (.02) than for the three Western sites (.19 for United States, .28 for Canada, and .17 for New Zealand). For South Korea, the transition from the severe class of childhood conduct syndrome to drug problems (.35) was much lower than in the three Western sites as well (.53 for United States, .62 for Canada, and .76 for New Zealand). Taiwan, however, showed a high transition rate for men from the severe class of childhood conduct syndrome to drug problems (1.00).

— Table 8.3. About Here —

Cross-Cultural Hypothesis Testing

Transition rates: For transition rates from childhood conduct syndrome to symptoms of drug dependence or abuse, differences in transition rates were tested for the transition rates from both the mild and severe classes of childhood conduct syndrome to drug problems. The results for men are shown in Table 8.4. Following the same convention, these transition parameters tested for equality are shown in “X”s in square tables in Table 8.4. A significant difference in the transition rates from the mild class of childhood conduct syndrome was found among men across all five sites, but that

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was mostly attributable to the East-West dichotomy. Respondents with mild childhood conduct problems were much less at risk for developing drug problems in the two Eastern sites than in the three Western sites. Drug problems appear to be less tied to mild childhood ASP expression in Eastern than Western societies. The same tendency was observed from the mild class of childhood conduct syndrome to drug use, but this could not be tested formally because they were not latent transition rates. Another significant difference among men concerned the transition rates from the mild childhood conduct syndrome between South Korea and Taiwan (p = .06). It is not clear if the lack of finding significant differences in the transitions from the severe class of childhood conduct syndrome is in part due to low class probabilities of this class, or due to a real lack of societal differences.

— Table 8.4. About Here —

Table 8.5 shows the results of cross-cultural hypothesis testing of transition rates from childhood conduct syndrome to drug problems for females. Because transition rates were not informative for South Korean and Taiwan females (See Table 8.3, footnote.), cross-cultural hypothesis testing was limited to tests among the three Western sites in females. The three Western sites were significantly different for the transition rates from the mild class of childhood conduct syndrome to drug problems, but not for the transition rates from the severe class of childhood conduct syndrome to drug problems. Results essentially replicated the findings for males, but here significant differences were found even among three Western societies. The lack of significant findings for transitions from the severe child class, again, could be due to the second childhood class being larger than the severe childhood class.

— Table 8.5. About Here —
Endorsement rates of symptoms of drug dependence or abuse: Results of hypothesis testing for the endorsement patterns are shown in Table 8.6. Normally the two Eastern sites are contrasted in a nested hypothesis, but in this case the test statistic yielded a negative $L^2$ reduction in the second step, which indicated incorrect estimation. Instead of contrasting East versus West, Western sites were contrasted with Taiwan and South Korea separately, as was done in previous chapters.

— Table 8.6. About Here —

Results indicate that, for both males and females, all five sites displayed significantly different endorsement patterns. Among men, this was mainly due to variances among the three Western sites and the difference between the three Western sites and South Korea. For women the differences were due mainly to differences between the three Western sites and South Korea and Taiwan, as the three Western sites were fairly homogeneous ($p = .602$). The results are somewhat counter-intuitive from the differences depicted visually. The formal testing detected substantial differences in endorsement probabilities, as well as relative differences of endorsement across symptoms.

Summary Findings

The overall patterns of site differences involving childhood conduct syndrome, drug use level, and symptoms of drug dependence or abuse, resemble more closely the patterns of associations between childhood conduct syndrome and adult form of antisocial personality than the patterns observed for alcohol use and alcoholism. In contrast to alcohol use and alcoholism, exceedingly low endorsement rates of both use and problem use made estimation more difficult. In some cases, results were uninformative because the number of observations was too low or the variability observed was simply insufficient.

Class structure and endorsement patterns: Due to the insufficient number of measures, three
observed “classes” were substituted a priori to represent the drug use level. The 2-class solution was the only reasonable option for drug abuse symptoms, because rates of endorsing some symptoms were so low in the two Eastern societies, especially among females. When limited to the subsample of 5+ times users, variations in class prevalence across five international sites did not exhibit a systematic trend. With a history of 5+ times drug use, 30% or less appeared to become drug abusers.

*Transition rates:* Similar patterns were observed for both the transition rates from childhood conduct syndrome to drug use, and to drug problems: A typical dose-response pattern was displayed with the more severe levels of childhood conduct syndrome yielding higher transition rates to the higher level of drug use or to the affected class of drug abuse. Transition from the mild class of childhood conduct syndrome appeared to be more variant across the five international sites than was transition from its severe class, whether the outcome was drug use or drug problems.

*Cross-cultural differences:* Endorsement patterns were different between the Western and Eastern countries. The rates were noticeably lower for emotional and psychological consequences and social/legal/occupational consequences of drug use in the two Eastern countries compared to the three Western countries. Testing the differences of endorsement patterns yielded the results that all five sites displayed significantly different patterns because endorsement probabilities were also variant across the five sites. The three Western sites showed much higher transition rates than did the two Eastern sites from mild and severe classes of childhood conduct syndrome into 5+ times drug use category. In Western sites, the transition rate to “any use” was lower than the transition rate to 5+ times use.

*Gender differences:* The prevalence rates of use and 5+ times use were lower among females than among males across the five societies, but they were very low in South Korea and Taiwan for
both males and females. Gender differences were not as striking for transition rates to drug use and abuse, and endorsement patterns of symptoms of drug dependence or abuse as those observed alcoholism. This may be due to the illegal aspect of drug use and abuse: Drug use is not acceptable whether one is male or female. The transition rates were similar between the males and females of each country, even though the prevalence rates of drug use and drug use five times or more were substantially higher in men than in women in each country. Endorsement patterns were similar across gender and differences in endorsement were rather similar among the three Western sites.
Table 8.1. Drug Use and Measures of Drug Dependence or Abuse

<table>
<thead>
<tr>
<th>Drug use:</th>
<th>Measures of drug dependence or abuse:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any use</td>
<td>Tried to cut down on drug use but couldn’t</td>
</tr>
<tr>
<td>Used drug 5 or more times in life</td>
<td>Emotional or psychological problems from drug use</td>
</tr>
<tr>
<td></td>
<td>Physical health problems from drug use</td>
</tr>
<tr>
<td></td>
<td>Used drug every day for 2 weeks</td>
</tr>
<tr>
<td></td>
<td>Felt like needed drug or was dependent upon it</td>
</tr>
<tr>
<td></td>
<td>Problems with family, friends, on the job, at school, or with police due to drug use</td>
</tr>
<tr>
<td></td>
<td>Needed larger amounts to get effect or couldn’t get high on same amount</td>
</tr>
<tr>
<td></td>
<td>Felt sick because stopped or cut down on drug use</td>
</tr>
</tbody>
</table>

*Measures of dependence and abuse correspond to DMS-III.*
Table 8.2. Transition Rates from Childhood ASP to Drug Use

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None</td>
<td>Any</td>
</tr>
<tr>
<td>C1</td>
<td>.76</td>
<td>.07</td>
</tr>
<tr>
<td></td>
<td>St. Louis, U.S.A.</td>
<td>(Male = 970)</td>
</tr>
<tr>
<td></td>
<td>(Female = 1,432)</td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>.35</td>
<td>.14</td>
</tr>
<tr>
<td>C3</td>
<td>.10</td>
<td>.08</td>
</tr>
<tr>
<td></td>
<td>Edmonton, Canada</td>
<td>(Male = 1,206)</td>
</tr>
<tr>
<td></td>
<td>(Female = 1,692)</td>
<td></td>
</tr>
<tr>
<td>C1</td>
<td>.64</td>
<td>.17</td>
</tr>
<tr>
<td>C2</td>
<td>.20</td>
<td>.11</td>
</tr>
<tr>
<td>C3</td>
<td>.06</td>
<td>.12</td>
</tr>
<tr>
<td></td>
<td>Christchurch, New Zealand</td>
<td>(Male = 504)</td>
</tr>
<tr>
<td></td>
<td>(Female = 994)</td>
<td></td>
</tr>
<tr>
<td>C1</td>
<td>.78</td>
<td>.11</td>
</tr>
<tr>
<td>C2</td>
<td>.58</td>
<td>.14</td>
</tr>
<tr>
<td>C3</td>
<td>.26</td>
<td>.10</td>
</tr>
<tr>
<td></td>
<td>South Korea</td>
<td>(Male = 2,431)b</td>
</tr>
<tr>
<td></td>
<td>(Female = 2,620)b</td>
<td></td>
</tr>
<tr>
<td>C1</td>
<td>.96</td>
<td>.02</td>
</tr>
<tr>
<td>C2</td>
<td>.83</td>
<td>.12</td>
</tr>
<tr>
<td>C3</td>
<td>.99</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>Taiwan</td>
<td>(Male = 5,229)b</td>
</tr>
<tr>
<td></td>
<td>(Female = 4,896)c</td>
<td></td>
</tr>
</tbody>
</table>

Note. Transition rates were estimated separately for country and gender.

*Inflated estimate due to rounding error. *Only 2 classes of childhood ASP were estimated because of low prevalence of childhood ASP symptoms. *Only 2 classes of childhood ASP and drug use were estimated because of low prevalence of childhood ASP and drug use symptoms.
Table 8.3. Transition Rates from Childhood ASP to Symptoms of Drug Dependence or Abuse

<table>
<thead>
<tr>
<th></th>
<th>Male (n = 10,339)</th>
<th>Female (n = 11,633)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C1</td>
<td>C2</td>
</tr>
<tr>
<td>C1</td>
<td>.99</td>
<td>.01</td>
</tr>
<tr>
<td>C2</td>
<td>.81</td>
<td>.19</td>
</tr>
<tr>
<td>C3</td>
<td>.47</td>
<td>.53</td>
</tr>
<tr>
<td>C1</td>
<td>.99</td>
<td>.01</td>
</tr>
<tr>
<td>C2</td>
<td>.72</td>
<td>.28</td>
</tr>
<tr>
<td>C3</td>
<td>.38</td>
<td>.62</td>
</tr>
<tr>
<td>C1</td>
<td>.98</td>
<td>.02</td>
</tr>
<tr>
<td>C2</td>
<td>.83</td>
<td>.17</td>
</tr>
<tr>
<td>C3</td>
<td>.24</td>
<td>.76</td>
</tr>
<tr>
<td>C1</td>
<td>.99</td>
<td>.01</td>
</tr>
<tr>
<td>C2</td>
<td>.99</td>
<td>.01</td>
</tr>
<tr>
<td>C3</td>
<td>.65</td>
<td>.35</td>
</tr>
<tr>
<td>C1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>C2</td>
<td>.98</td>
<td>.02</td>
</tr>
<tr>
<td>C3</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Note. Transition rates were computed simultaneously across sites and separately for gender.

*Female data excluded because of lack of endorsement of dependence or abuse symptoms that constitute Class C2.
Table 8.4. Differences in Transition Rates from Childhood Conduct Syndrome Symptoms to Drug Dependence or Abuse Among Males

<table>
<thead>
<tr>
<th></th>
<th>$\hat{\Omega}_{ij}$</th>
<th>$L^2$</th>
<th>d.f.</th>
<th>p</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>All five sites</td>
<td></td>
<td>65.206</td>
<td>4</td>
<td>.001</td>
<td>10,339</td>
</tr>
<tr>
<td>All five sites</td>
<td></td>
<td>4.777</td>
<td>4</td>
<td>.311</td>
<td>10,339</td>
</tr>
<tr>
<td>Three Western sites</td>
<td></td>
<td>4.941</td>
<td>2</td>
<td>.085</td>
<td>2,679</td>
</tr>
<tr>
<td>Three Western sites</td>
<td></td>
<td>1.03</td>
<td>2</td>
<td>.598</td>
<td>2,679</td>
</tr>
<tr>
<td>Two Eastern sites</td>
<td></td>
<td>0.400</td>
<td>1</td>
<td>.527</td>
<td>7,660</td>
</tr>
<tr>
<td>Two Eastern sites</td>
<td></td>
<td>3.54</td>
<td>1</td>
<td>.060</td>
<td>7,660</td>
</tr>
<tr>
<td>Western sites versus Eastern sites</td>
<td></td>
<td>59.865</td>
<td>1</td>
<td>.001</td>
<td>10,339</td>
</tr>
<tr>
<td>Western sites versus Eastern sites</td>
<td></td>
<td>0.207</td>
<td>1</td>
<td>.649</td>
<td>10,339</td>
</tr>
</tbody>
</table>

Note. $L^2$ (-2 log likelihood) is the increase in $G^2$ when transition rates ($\hat{\Omega}_{ij}$) are constrained to be equal, compared to $G^2$ when the rates were free parameters. All analysis was done on the full (n = 10,339) set; n refers to the number of observations affected by the restrictions. d.f.: degrees of freedom.
Table 8.5 Differences in Transition Rates from Childhood Conduct Syndrome Symptoms to Drug Dependence or Abuse Among Females

<table>
<thead>
<tr>
<th></th>
<th>$\hat{\alpha}_{ij}$</th>
<th>$L^2$</th>
<th>d.f.</th>
<th>p</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three Western sites</td>
<td>x x</td>
<td>15.873</td>
<td>2</td>
<td>.001</td>
<td>4,118</td>
</tr>
<tr>
<td>Three Western sites</td>
<td>x x</td>
<td>1.262</td>
<td>2</td>
<td>.532</td>
<td>4,118</td>
</tr>
</tbody>
</table>

Note. $L^2$ (-2 log likelihood) is the increase in $G^2$ when transition rates ($\hat{\alpha}_{ij}$) are constrained to be equal, compared to $G^2$ when the rates were free parameters. All analysis was done on the full set ($n = 11,633$); $n$ refers to the number of observations affected by the restrictions. Eastern sites not included because of low prevalence. d.f.: degrees of freedom.
Table 8.6. Differences in Endorsement Patterns of Symptoms of Drug Dependence or Abuse Across Sites

<table>
<thead>
<tr>
<th>Hypotheses tested</th>
<th>$L^2$</th>
<th>d.f.</th>
<th>p(^a)</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All five sites different from each other</td>
<td>160.349</td>
<td>64</td>
<td>.001*</td>
<td>857</td>
</tr>
<tr>
<td>Western sites difference from each other</td>
<td>67.712</td>
<td>32</td>
<td>.001*</td>
<td>770</td>
</tr>
<tr>
<td>Western sites versus South Korea</td>
<td>72.824</td>
<td>16</td>
<td>.001*</td>
<td>831</td>
</tr>
<tr>
<td>Western sites versus Taiwan</td>
<td>24.466</td>
<td>16</td>
<td>.080</td>
<td>796</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All 5 societies different from each other</td>
<td>119.615</td>
<td>64</td>
<td>.001*</td>
<td>992</td>
</tr>
<tr>
<td>Western sites difference from each other</td>
<td>29.338</td>
<td>32</td>
<td>.602</td>
<td>894</td>
</tr>
<tr>
<td>Western sites versus South Korea</td>
<td>47.091</td>
<td>16</td>
<td>.001*</td>
<td>948</td>
</tr>
<tr>
<td>Western sites versus Taiwan</td>
<td>45.617</td>
<td>16</td>
<td>.001*</td>
<td>938</td>
</tr>
</tbody>
</table>

Note. $L^2$ (-2 log likelihood) is the increase in $G^2$ when endorsement rates are constrained to be equal, compared to $G^2$ when the rates were free parameters. d.f.: degrees of freedom.

\(^a\)p stated as .001 is #.001.

*p < .05.
Figure 8.1. Endorsement Patterns for Drug Abuse Symptoms Among 5+ Users

Male

- St. Louis, U.S.A.
- Edmonton, Canada
- Christchurch, New Zealand
- South Korea
- Taiwan

Female

- St. Louis, U.S.A.
- Edmonton, Canada
- Christchurch, New Zealand
- South Korea
- Taiwan
Chapter 9.

Summary Findings and Conclusions

The research reported in this monograph stressed the need for observational epidemiology to choose contrasting conditions to show maximum effects of underlying factors on differential levels of substance use and abuse among individuals. In this context, cross-national comparisons of developmental psychopathology provide insights into how risk and protective factors, which mediate or moderate the developmental pathways, operate differently across societies. If appropriate databases already exist, selected hypotheses on cross-national differences and similarities based on one’s conceptual model can be tested before designing a more complex multi-national longitudinal study that can decisively show the relative importance of risk and protective factors in mediating and moderating developmental trajectory. This monograph has made an attempt to test a model of developmental psychopathology, using five existing international epidemiologic datasets. In the concluding chapter, we provide summaries of our conceptualization, methods, main findings, limitations, and implications of the current research.

Conceptualization

Two background conceptualizations thread through the design and conduct of the research reported in this monograph: one is a multiple pathway model of developmental psychopathology; the other is our cross-cultural framework as a way to mimic a case-control design. Our simple and heuristic model of developmental psychopathology was derived from reviews of numerous findings based on the assumptions that the developmental process has discernible stages across individuals, and that the course is mediated or moderated in response to influences of environmental factors or as a result of stage-specific differential gene expressions. Available knowledge on the cross-cultural
applicability of these concepts and pathways suggest that the multiple pathway model we specified is likely to be applicable to most societies, but developmental trajectories may differ considerably across societies, depending on the nature and strengths of risk and protective factors.

The motivation behind our interest in the cross-cultural approach was simple, and its utility can be easily comprehended. Nonetheless, a number of conceptual and methodological challenges surround the conduct of cross-national research. We examined two existing polemic positions, the universalist approach and the culturalist approach, so as to characterize the advantages and disadvantages of the approach we have taken in carrying out the research reported here. We have adopted the approach to apply measures that are uniformly assessed. There were two primary reasons for taking this approach: First, our basic objective was to show that some universal patterns of developmental psychopathology and substance abuse, as well as societal deviations from the expected pathways, do exist. Second, in consideration for moving from judgment-based clinical classifications to empirically based statistical classifications of developmental psychopathology, it was advantageous to employ measures that are amenable to formal statistical testing of classifications. The costs of such an approach are acknowledged, and are described later in this chapter.

**Database and Methods**

Five existing general-population epidemiologic surveys were used to examine cross-national similarities and differences in the childhood and adult forms of antisocial personality, alcoholism, and drug abuse, and transitions from childhood antisocial personality to the three “adult outcomes.” The five surveys were collected in the United States (St. Louis), Canada (Edmonton), New Zealand (Christchurch), South Korea, and Taiwan, all in early to middle 1980's. As products of a unique
moment in the history of psychiatric epidemiology, these surveys all utilized the Diagnostic Interview Schedule, one of the most widely used standardized psychiatric assessments at the time, as a tool for collecting uniform measures. The surveys applied very similar sampling methods in a general-population framework to assure the generality of findings.

To avoid imposing a Western diagnostic system, latent class analysis and its extension, latent transition analysis (LTA), were extensively employed, augmented by logistic regression methods and the structural equation modeling. LTA allows “direct” estimates of transition rates, while in the logistic regression approach, transition rates are estimated from assigning individuals to specific classes. Structural equation modeling was intended to assess the cross-cultural applicability of the DIS measures.

**Summary Findings**

Response patterns and the latent class structure of childhood conduct syndrome were more varied across societies and by gender than were the latent class structure of adulthood antisocial personality, alcohol abuse, and drug use problems. The basic premise of the multiple-pathway model was replicated in all international sites. However, symptom reporting patterns and the discrete class structure of childhood conduct syndrome, adult antisocial personality, alcohol abuse, and drug problems, as well as the magnitudes of association of childhood conduct syndrome with “adult” outcomes, varied by society and gender. Differences were most pronounced across gender and the West-East distinction. Some differences were also found between Korea and Taiwan, and between New Zealand and the two other Western sites, the United States and Canada.

**Class Structure and Endorsement Patterns**

*Antisocial personality:* The class structure of antisocial personality measured by those symptoms
defined in DSM-III was uniformly simpler for the adult form than for the child form. Less variation was observed in the class patterns of the adult form than the childhood form of antisocial personality across the five international sites. Across the five societies, the classes appeared to reflect the underlying severity of childhood and adult antisocial syndrome, and no indication of subtypes of these syndromes was observed. In general, DSM-III based measures of childhood and adult ASP appeared to be acceptable across the five societies considered. Nonetheless, extremely low endorsements of almost all items in the two Eastern societies, especially in Taiwan, raises the possibility that DSM-III based indicators may have missed some culturally specific expressions of antisocial behavior.

Alcohol use and alcoholism: The 3-class solution was judged most appropriate for alcohol use and alcoholism. Classes were based primarily on the severity dimension. Until classes were broken down to four or more classes, no subtypes of alcoholism were observed. Among South Korea and Taiwan females, the third class may not have represented the most severe category of alcoholism.

Drug use and drug problems: Three observed classes were substituted a priori to represent the drug use level due to a lack of sufficient numbers of measures. The 2-class solution was the only reasonable option for drug abuse symptoms, because rates of endorsing some symptoms were so low in the two Eastern societies, especially among females. When limited to the subsample of 5+ times users, variations in the class prevalence of drug problems across five international sites did not exhibit a systematic trend.

Transition from Childhood Conduct Syndrome

Adult antisocial personality: Evidence for a strong link between childhood conduct syndrome behaviors and adult symptoms for ASP was shown across the five countries considered. Increased
odds ratios for being in the affected adult ASP class were shown for individuals with a history of mild or severe childhood conduct syndrome across five countries, suggesting that the DSM child-to-adult continuity approach can be applied universally with modifications in measures.

*Alcohol use and alcoholism:* Patterns of transition from childhood conduct syndrome to alcohol use to abuse were more variant across the international sites examined than were the transitions to adult antisocial personality. In general, the more severe the conduct syndrome, the higher the probability of starting to drink. However, the transition from mild childhood conduct syndrome was much more variant across five sites.

*Drug use and drug problems:* Similar patterns of positive association were observed for both the transition rates from childhood conduct syndrome to drug use, and to drug problems. Because class prevalences of severe childhood conduct syndrome and drug problems were so small among South Korean and Taiwan females, transition rates in these categories did not provide informative results.

**Cross-National Differences**

*Adult antisocial personality:* Pervasive differences were found between the East (South Korea and Taiwan) and the West (U.S.A., Canada, and New Zealand). These results suggest cross-national differences could arise from differences in the levels of childhood symptoms, with paths to adult antisocial personality affected by different norms, customs, and socialization in adolescence and adulthood.

*Alcohol use and alcoholism:* The endorsement patterns for alcohol use level and alcohol dependence/abuse syndrome were found to be similar across international sites. However, excessive drinking was more readily endorsed compared to 7+ drinks a week in the two Eastern societies.
among those who drank more than a minor amount. The opposite was true in the Western societies. Social problems were more commonly endorsed in the Eastern societies than in the Western societies among those in the severe class of alcoholism compared to other symptoms. The data did not support cross-culturally divergent paths to alcohol use for children with mild childhood conduct syndrome. The West-East dichotomy, found for the transition from childhood to adult antisocial personality, was not replicated for the transition from childhood ASP to alcohol use level in males. South Korea and Taiwan differed from each other; and U.S. and South Korean male drinkers appeared to be similar. New Zealand’s transition pattern from alcohol use to alcoholism was found to be different from that in other societies.

**Drug use and drug problems:** The rates of endorsing drug use problems were different between the Western and Eastern countries. They were noticeably lower for emotional and psychological consequences and social/legal/occupational consequences of drug use in the two Eastern countries compared to the three Western countries. Symptom reporting patterns were found to be different across all five sites as a result of different levels of overall symptom reporting, as well as relative differences of reporting across symptoms. The overall patterns of site differences in transitions from childhood conduct syndrome to drug use to drug problems resembled more closely the patterns of associations between childhood conduct syndrome and the adult form of antisocial personality than the transition patterns observed for alcohol use and alcoholism. Transition from the mild class of childhood conduct syndrome appeared to be more variant across the five international sites than were transitions from its severe class, whether the outcome was drug use or drug problems. The three Western sites showed much higher transition rates than the two Eastern sites from mild and severe classes of childhood conduct syndrome into the 5+ times drug use category.
Gender Differences

**Antisocial personality:** Gender differences in symptom reporting were clearer in the adult syndrome of ASP than in the childhood syndrome. Expressions of Asian female conduct problems and antisocial behavior could be so different from those of Western males that the validity of the Western-male based model may need reconsideration. However, significant underreporting is another possible explanation. It appears that these gender differences in expression of conduct syndrome and adult antisocial behaviors could well be a major reason for the differences in prevalence. The transition rates from the childhood to the adult form of ASP are less distinct between the two genders.

**Alcohol use and alcoholism:** Among females, the majority of mild drinkers stayed free from alcohol problems. The transition from childhood conduct syndrome to the high drinking class showed a clear West-East dichotomy because South Korean and Taiwan females were very similar. This was contrary to the clear differences found between South Korean and Taiwan males. Gender differences in class probabilities and transition patterns between South Korean males and females lends support to the substantial impact of sociocultural factors, given the knowledge of alcohol sensitivity genes among Koreans, although it is still possible that alcohol sensitivity genes somehow interact with sex-specific genes for expression.

**Drug use and drug problems:** The prevalence of use and 5+ times use were lower among females than among males across five societies, but they were very low in South Korea and Taiwan for both genders. Gender differences were not as striking for transition rates to drug use and abuse as those observed for alcoholism, although the prevalence rates of drug use and drug use five times or more were substantially higher in men than in women in each country. Endorsement patterns were
similar across the two genders.

**Limitations**

The current research is limited in several respects. Some cautions thus are in order.

*Old surveys:* Although the opportunity to test cross-national hypotheses on the developmental psychopathology using large general-population database does not come easily, the database is not new, having been collected more than a decade ago. Asian societies have gone through tremendous changes since that time. Particularly, drug abuse, which was once thought of as an American ill, has become a global problem. It is expected that prevalence rates of drug use and abuse may be much higher now in both South Korea and Taiwan. However, those patterns that existed before the current rapid changes may have helped preservation of protective factors against adverse outcomes of childhood conduct and behavior problems. From a prevention viewpoint, understanding such factors would be even more important than monitoring of the trends over time.

*Retrospective reporting:* Our model is developmental, but the information used in this monograph was obtained from retrospective accounts from those who reached age 18 or older at the time interview was conducted. Validity of retrospective reporting is generally accepted, but it does pose a potential problem if individuals have differential tendencies to report anything. For example, those who reported symptoms of antisocial behaviors after age 18 may be those people who fear sanctions less, therefore, they would be more likely also to report childhood symptoms.

Another limitation relates to the discrepancy found between our developmental model, assuming that specific behaviors occur in a given sequence, and the actual data for which time sequence cannot necessarily be assumed. Each behavior of the childhood conduct syndrome must have occurred before age 15, and adult antisocial behavior after age 18 or older. However, alcohol and drug use and
problems could have occurred any time before age 15, between 15 and 18, or after 18. A potential concern is related particularly to early substance use preceding the onset of childhood conduct syndrome, which in turn leads to adult antisocial personality. At least for those cohorts who reached adulthood by the 1980's, substance use rarely preceded the first appearance of a conduct problem, since the first problem typically occurred by age 8. Therefore, only a small proportion of respondents in this sample would have experienced substance use prior to the onset of childhood conduct syndrome. A substantial portion of U.S. children with conduct problems who are growing up now would experience a considerable level of substance concurrent with the development of conduct problems.

Limited range of measures: Alluded to already, the adoption of consistent diagnostic criteria alone does not necessarily ensure comparability when considering study results across cultures or societies, as this approach may limit cross-cultural validity. While an alternative model has not yet been developed in epidemiology, the current approach is limited by comparisons with only those that are validated based on the Western DSM classifications. As class structure in reality may reflect the number of measures in the model as well as variability across measures, the findings of latent classes are dependent on the measures we were able to include.

Limitations in statistical estimation: While its purpose of freeing us from the DSM approach was well served, the latent class analyses had their own shortcomings. The LCA’s difficulty with very sparse data is well known. In particular, estimates of symptom endorsement probabilities for female datasets in South Korea and Taiwan indicated the limited utility of LCA when applied to cross-national settings when the prevalence rates vary widely. This is unfortunate because the very purpose of this cross-cultural research -- comparing two seemingly identical behaviors in two groups,
one with a low prevalence and the other with a high prevalence -- was compromised. The problem of low prevalence is not limited to the LCA methodology. Problems were encountered with the structural equation modeling where low prevalence caused a mathematical problem with no successful remedies applied.

While the class assignment method allowed “connecting” individual cases to latent cells, information inevitably was lost. LTA bypassed this problem, but without the class assignment, additional analyses using other variables of interest (e.g., other demographic information) could not be carried out easily.

**Implications**

The basic multiple-pathway model was replicated in all international sites, therefore supporting the notion that such a developmental trajectory can be introduced in international research on substance abuse, albeit with some modifications. We found that class probabilities of the childhood form of antisocial personality were much lower in Asian societies, indicating differential effects of very early socialization or prenatal or genetic effects. Differences in transition rates between Eastern and Western societies at the time of these studies indicate that moderating environmental effects differed between them as well. The results of odds ratios show that a large proportion of boys in Western societies are mildly at risk for adult ASP. Prevention efforts might be most fruitful for this sub-population.

Developmental trajectories appeared to be affected by somewhat different sets of norms and cultural factors. Alcohol use being more widely accepted than drug abuse, we observed that transition patterns were more uniform across the five societies for antisocial personality and drug abuse than for alcoholism. In-depth examination of transition patterns using more culturally specific
measures allow better insight into how risk and protective factors might be operating in a specific society for each gender. Development of culturally appropriate risk and protective factors will then allow testing differential impacts of environmental factors or gene-environment interaction (if candidate genes are known).

Methodologically, the results of latent class modeling as applied in this study argue for LCA’s usefulness in abstracting correlated behaviors to discrete classes. Latent class modeling also is useful for group comparisons at an abstract level. Empirically derived latent classes may provide an alternative to the current DSM approach, which forces dichotomy. Future cross-cultural research needs to explore the areas of assessment of societal specific unique measures, and development of a new method of cross-cultural validation of semantically different measures. Inclusion of culturally validated measures will provide empirically based classification of psychopathology, which would not only be richer, but also more informative for clinical purposes.

Comparisons involving a very low prevalence are problematic within the current methodological frameworks. In the future, more systematic efforts would be desirable in cross-cultural research that attempt to take advantage of contact between low prevalence and high prevalence societies. Such efforts can involve an ascertainment strategy different from a general population approach, or the use of more flexible estimation techniques that can bypass the kinds of problems described in this appendix. Finally, a different type of cross-cultural research, one not restricted to comparing uniform measures, would need further exploration.
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