Chapter 9
General summary and discussion
GENERAL SUMMARY

The present thesis had two main aims: (1) to understand risk and protective factors of cannabis use in adolescents and young adults with a non-western ethnic background in the Netherlands (i.e., Surinamese, Moroccan, Turkish, Antillean, or Asian); and (2) to study the DSM-IV cannabis use disorder (CUD) criteria, including examining a) measurement bias across different subpopulations, and b) the extent to which cannabis use and the endorsement of CUD criteria were related to suicidal thoughts and behaviors. We addressed the first aim by focusing on acculturation as a specific risk factor for non-western immigrant adolescents and young adults in the Netherlands, and by studying the association of parenting practices with alcohol and cannabis use among native Dutch and non-western immigrant adolescents. The second aim was addressed by focusing on the functionality of CUD criteria in different subsamples (U.S. and the Netherlands, gender, and age groups) and by focusing on endorsement of CUD criteria in young adults in relation to suicidal thoughts and behaviors. In the following section, for the first and second aim separately, the main results and conclusions that can be derived from the studies are summarized.

Summary of main results and conclusions

PART I - Risk and Protective Factors for Cannabis Use

Part I of the present thesis focused on acculturation, affiliation with cannabis-using peers, and the sources of parental knowledge in relation to adolescent and young adult cannabis use. Chapter 2 provided an overview of the participants and measurements in the i4culture study. The study included a normal risk (NR) and a high risk (HR) population of non-western immigrant Dutch adolescents and young adults. The HR participants are, because of the amount of cannabis used in the past month, at increased risk of developing a CUD. In total, 989 participants were recruited for the NR sample, including 232 who also participated in a diagnostic interview, and 69 were recruited for the HR sample, including 60 participating in the interview. Measurements in the self-report questionnaire included lifetime, frequency, and quantity of substance use, substance use of friends and parents, parental monitoring and child disclosure, drug specific parenting, acculturation, and psychopathology. The interview was used to assess mental disorders according to
the criteria of DSM-IV and ICD-10, including substance use disorders, major depressive disorder and attention deficit hyperactivity disorder.

In chapter 3, we examined specific risk factors for cannabis use in non-western immigrant adolescents and young adults: acculturation strategy and linguistic acculturation. Controlling for religion and alcohol/tobacco use, acculturation strategy was not related to past year cannabis use, while linguistic acculturation was positively related to past year cannabis use. Non-western immigrant youngsters who speak the Dutch language at home were more likely to use cannabis than youngsters who speak the language of their parents’ country of origin. To understand this relation better, we examined whether this relation was mediated by affiliation with cannabis-using peers. Results showed that linguistically acculturated youths were more likely to affiliate with cannabis-using peers, which increased their likelihood of cannabis use. The direct relation between linguistic acculturation and cannabis use was retained, indicating that the relation between linguistic acculturation and cannabis use can only partly be explained by affiliation with cannabis-using peers. The results confirm the cultural values paradigm, where acculturation to a culture with a more positive value towards cannabis use is related to a higher likelihood of cannabis use, either directly, or through affiliation with cannabis-using peers.

The aim of chapter 4 was to study differences between native Dutch and non-western immigrant adolescents in the relation of the sources of parental knowledge, i.e., parental solicitation, parental control, and child disclosure, with alcohol and cannabis use. The findings were similar for native Dutch and immigrant adolescents: Higher levels of child disclosure were related to a lower likelihood of alcohol and cannabis use, while higher levels of parental solicitation were related to a higher likelihood of alcohol and cannabis use. Higher levels of parental control were related to a lower likelihood of using alcohol weekly only. Models were adjusted for gender, age, religion, and cohort. The findings of this study suggest that prevention and intervention programs targeting on parental monitoring and child disclosure are applicable to both native and non-western immigrant adolescents in the Netherlands.
Chapter 5 focused on the prospective relation of the sources of parental knowledge with alcohol and cannabis use in native Dutch adolescents, using a longitudinal design across the adolescent years (age 13 to 18 years). The results suggest that parent- and adolescent-reported child disclosure is related to lower levels of alcohol and cannabis use over time, while adolescent-reported parental solicitation is related to higher levels of alcohol and cannabis use over time. Alcohol and cannabis use are also prospectively related to adolescent-reported parenting practices: higher levels of alcohol use are related to lower levels of parental control over time, while cannabis use is related to higher levels of parental solicitation over time. We can conclude that voluntary child disclosure is important for the prevention of substance use, and that alcohol and cannabis use affect perceived parenting practices.

Part II – Cannabis Use Disorder Criteria
In part II of this thesis, CUD criteria were studied, focusing on measurement bias across the CUD criteria, and on the relation of cannabis involvement, including cannabis use and endorsement of CUD symptoms, with suicidal thoughts and behaviors.

Chapter 6 focused on lifetime endorsement of DSM-IV CUD criteria across U.S. and Dutch young adult cannabis users. Measurement bias across the countries was detected for the criteria legal problems, failed quit attempts, use despite problems, and withdrawal symptoms. For identical levels of CUD, these criteria were more likely to be endorsed by U.S. than by Dutch cannabis users. Additionally, we found that at identical levels of CUD, men were more likely to endorse hazardous use, legal problems, and tolerance than women. These results suggest that lifetime CUD criteria are biased across countries and genders, indicating that differences in prevalence estimates should be interpreted in light of this bias.

To examine whether prevalence differences of DSM-IV CUD criteria between younger and older adults, and male and female cannabis users, reflect true differences or reflect biased criteria, we examined measurement bias of past year CUD criteria across different age groups (18-24 years and 25 and above) and genders simultaneously in Chapter 7. Results indicated that past year CUD criteria
are measurement invariant across these age groups and gender. From this study, it could be concluded that past year CUD criteria are applicable to an adult population of all ages, as well as to male and female cannabis users.

The aim of chapter 8 was to examine cannabis involvement, defined as cannabis use or endorsing 1 – 2 or three or more DSM-IV CUD criteria, in relation to suicidal thoughts and behaviors. Cannabis involvement was positively related to both suicidal ideation and unplanned suicide attempt, while it was not related to planned suicide attempt. Only endorsing three or more symptoms of CUD was related to suicidal planning. Possibly, a third common factor, such as impulsivity, could explain the relation of cannabis involvement with unplanned suicide attempt.
GENERAL DISCUSSION
This thesis examined risk and protective factors of cannabis use for native and non-western immigrant Dutch adolescents, reported on measurement bias across DSM-IV CUD criteria, and elucidated the relation of cannabis involvement with suicidal thoughts and behaviors. In the following section, a general discussion of the findings is presented, and limitations and strengths of the research are discussed, concluding with implications and recommendations for future research.

Risk and Protective Factors for Cannabis Use
The present thesis examined various risk and protective factors of cannabis use among non-western immigrant adolescents, including acculturation, affiliation with cannabis-using peers, and sources of parental knowledge.

Acculturation
The present thesis showed that linguistic acculturation, i.e. speaking the Dutch language with parents, is an important risk factor for past year cannabis use in immigrant adolescents in the Netherlands. This may be explained by the cultural values paradigm (Unger et al., 2004), according to which acculturation to a country with positive values toward substance use increases the risk of its use. In the Netherlands, marijuana is de-penalized, meaning that possession of a small amount of marijuana for those over age 18 is not being prosecuted. Also, coffee shops, where cannabis products can be bought, are legalized, although owners have to comply with specific regulations, such as no advertising and no sales to minors. This tolerant attitude towards cannabis use from the government could expand to a positive attitude toward its use in Dutch citizens, and therefore, in Dutch parents. Although the Dutch society in general may express a tolerant point of view when it comes to cannabis use, parents with a non-western ethnic background may differ in their perspective. Parents from Surinamese, Moroccan, Turkish, Antillean, and Asian background are not raised with the same tolerant point of view towards cannabis use as native Dutch parents, and may thus express themselves more negatively, or might set strict rules regarding cannabis use for their adolescent children. However, as language use has been found to be the most important predictor of acculturation (Rogler, Cortes, & Malgady, 1991; Serrano & Anderson,
2003), parents who speak the Dutch language with their children might be more acculturated, and may have taken over some of the Dutch habits and values regarding substance use, including a similar tolerant attitude. Consequently, when adolescents and young adults speak the language of their culture of origin with their parents, this may be a proxy of a conservative perspective towards cannabis use in the family, protecting children from its use. However, as we did not assess parental attitudes towards cannabis use, we can only speculate about its role in the association between linguistic acculturation and adolescent cannabis use.

Results of this study further showed that acculturation strategy was not related to past year cannabis use. We examined four different strategies: Assimilation, integration, separation, and marginalization (Berry, 1997). Assimilation, i.e., replacing the native cultural orientation with the host culture orientation, and integration, i.e., combining aspects of the host culture with aspects of the native culture, are both characterized by relatively high levels of adoption of the cultural identity of the host country. Separation, i.e., retaining the native cultural orientation while rejecting the host culture orientation, and marginalization, i.e., rejecting both cultures, are both marked by low levels of adoption of the cultural identity of the host country. Following the reasoning of the cultural values paradigm, we expected that immigrant youths adopting the assimilation strategy, characterized by a strong bond to the host culture and a weak bond to the culture of origin, would be at highest risk for past year cannabis use when compared to immigrant adolescents adopting one of the other strategies. However, as factor analysis showed that immigrants using the assimilation strategy could not be distinguished in our sample, we could not test this hypothesis. Because adolescents who adopt the integration strategy also experience a strong bond to the host culture, in addition to a strong bond to the culture of origin, we expected this group to have the next highest risk of cannabis use. Yet, adolescents adopting the integration strategy were not more likely to have used cannabis when compared to adolescents rejecting the host culture orientation, i.e., those adopting the marginalization or separation strategy. The equally strong bond with the culture of origin, where cannabis use is less tolerated than in the Netherlands, may protect adolescents adopting the integration strategy against the use of cannabis.
Our findings pertaining to the acculturation strategies also seem not in line with an alternative paradigm to explain the relation between acculturation and cannabis use, the stress/coping paradigm (Unger et al., 2004). According to this paradigm, the influence of stressful experiences during the acculturation process (e.g., language barriers, discrimination) increases the risk of substance use when coping skills of immigrant adolescents are insufficient. Berry (2006) concluded that the marginalization strategy is related to the highest levels of stress, and therefore, adolescents adopting this strategy would be expected to be at the highest risk of cannabis use following this paradigm, which was not supported by our findings. Unfortunately, we did not measure acculturative stress, and could therefore not test the link between acculturative stress and cannabis use. It would be interesting for future research to further explore the relationship between acculturation strategy, acculturative stress and cannabis use.

Because the attitude toward cannabis use is less tolerant in any of the countries of origin of the immigrant participants than in the Netherlands, we expected the cultural values paradigm to be equally applicable to all immigrant adolescents, irrespective of background. In addition, due to very low levels of cannabis use in adolescents with Turkish and Moroccan backgrounds, most of whom reported to be religiously affiliated with the Islam, associations between acculturation and cannabis use could not be examined in these individual subgroups of immigrants. Because of these reasons we examined the association between acculturation and cannabis use in a sample consisting of immigrant adolescents of various backgrounds. However, this may have obscured possible differences between subgroups of immigrants. For example, the integration strategy was reported somewhat less by the Antillean adolescents (25%) than by the other ethnic subgroups (over 30%), while the prevalence of past year cannabis use of Antilleans was similar to that of Surinamese and Asian adolescents. Possibly, for Antillean adolescents only, rejecting the host culture is perhaps related to cannabis use. Although subsequent analyses on adolescents from Antillean origin did not support this assumption, power issues do not allow any strong conclusions about this association. To examine whether there are different relations between acculturation and cannabis use across backgrounds, future research could study subgroups with diverse backgrounds separately.
Affiliation with cannabis-using peers

Another important risk factor that was found in the present thesis is affiliation with peers who use cannabis. The relation between linguistic acculturation and cannabis use was partly explained by affiliation with cannabis-using peers. Possibly, peers of linguistically acculturated immigrant youths are also more acculturated to the Dutch culture, or are of Dutch origin. Peers have been found to play a key role in predicting adolescent substance use (e.g., Coronges, Stacy, & Valente, 2011; Creemers et al., 2010; De La Haye, Green, Kennedy, Pollard, & Tucker, 2013; Duan, Chou, Andreeva, & Pentz, 2009). It is possible that peers’ use of substances influences the adolescents’ use, or that the adolescent selects friends that are similar in various characteristics, including (attitudes towards) substance use. For alcohol and cigarette use, both influence by friends and selection of friends have been demonstrated (e.g., Hoffman, Monge, Chou, & Valente, 2007; Go, Green, Kennedy, Pollard, & Tucker, 2010; Poulin, Kiesner, Pedersen, & Dishion, 2011). For cannabis use, results are less clear, although a recent study suggests that especially selection of friends is important (De La Haye et al., 2013). As our measure did not allow for differentiation between peer selection and peer influence, it is not clear from the present thesis which aspect of peer relations is most related to cannabis use in immigrant youths.

Sources of parental knowledge

The present thesis further examined the relation of the sources of parental knowledge, i.e., parental solicitation, parental control, and child disclosure, with alcohol and cannabis use in adolescents. In a cross-sectional study, we compared native Dutch adolescents with non-western immigrant adolescents aged between 15 and 17 years, to examine possible differences in the relation of parenting practices and child disclosure with substance use. In this study, we excluded adolescents who were religiously affiliated with the Islam (n = 132, with 57.6% of Moroccan origin, 26.5% Turkish, 5.3% Surinamese, and 10.6% other) because of the very low prevalence of substance use in this group of individuals. This low prevalence implies that Islamic youth, with stringent regulations and social norms and values about substance use, are more inclined to refrain from substance use than youth with another or without religious beliefs. The few participants from this group that did
report alcohol and cannabis use, may therefore reflect a much more deviant behaving group within their own culture as compared to youth who are affiliated with another religion or who are not religious. Although it is unclear whether these small number of cases would really make a difference in the overall findings, we decided to exclude adolescents who were religiously affiliated with the Islam from the study.

The results of this comparative study indicate that communication between parents and children is related to alcohol and cannabis use in a similar manner for native and non-western, immigrant Dutch adolescents: Higher levels of parental solicitation were associated with a higher likelihood of alcohol and cannabis use, while higher levels of child disclosure were associated with a lower likelihood of alcohol and cannabis use. Higher levels of perceived parental control were associated with lower levels of weekly alcohol use. Given the cross-sectional design of this study, the direction of the associations remains unknown. In other words, the presence of parent-effects (i.e., the influence of parental solicitation, parental control, and child disclosure on substance use), and the presence of child-effects (i.e., the influence of substance use on parental solicitation, parental control, and child disclosure) cannot be established. Therefore, as example, the cross-sectional association of parental solicitation with alcohol and cannabis use could be interpreted as reflecting a parent-effect, e.g., parents react to precursors of substance use, such as affiliation with delinquent and substance using peers, and early school leaving (Lynskey & Hall, 2000). Conversely, it may also reflect a child-effect, e.g., adolescent alcohol and cannabis use increased the level of perceived parental solicitation over time. Caution thus needs to be taken when interpreting these findings, and longitudinal studies are advised to disentangle the order of events.

To determine the presence of parent- and child effects, we subsequently performed a longitudinal study in a sample of native Dutch adolescents. In our longitudinal study, we found parent-effects for child disclosure and perceived parental solicitation, indicating that child disclosure decreased and parental solicitation increased the likelihood of alcohol and cannabis use over time. Previous studies propose several explanations for the prospective relation of child disclosure with alcohol and cannabis use. As child disclosure has been found to be the most important source of parental knowledge (e.g., Stattin & Kerr, 2000; Kerr & Stattin,
2000; Keijzers et al., 2009), it is possible that parents of children who show high levels of disclosure are better able to give their children advice and guidance on important decisions, such as using substances (Buhrmester & Prager, 1995; Marshall et al., 2005). A second explanation is that personality explains the negative relation between disclosure and substance use. More specifically, voluntary disclosure has been related to an agreeable personality (Sherman, 2010), which has been found to be negatively related to substance use (Walton & Roberts, 2004). The results on child disclosure suggest that stimulating child disclosure by increasing positive reactions, in terms of attempted understanding and warmth, and decreasing negative reactions in terms of emotional outburst, coldness, and negative reactions to disclosure (Tilton-Weaver et al., 2010), may decrease the risk of cannabis use.

Nevertheless, stimulating disclosure might be a difficult task, and more research is necessary on the effectiveness of increased child disclosure on subsequent substance use. In immigrant adolescents, the association between child disclosure and adolescent alcohol and cannabis use might be similar as in our longitudinal study among Dutch native youth, where child disclosure predicts lower levels of alcohol and cannabis use. Still, in Dutch immigrant youth, a third explanation for this association might also be possible. As immigrant parents from non-western countries may be less tolerant toward substance use than native Dutch parents, immigrant children might be more reluctant to disclose, which would indicate a reverse relation of immigrant adolescents’ substance use influencing level of child disclosure. Longitudinal relations across immigrant adolescents are thus important to be able to make strong conclusions.

In addition, our longitudinal study demonstrated child-effects. Alcohol use, on the one hand, predicted a decrease in perceived parental control. Assuming that parents are aware of their children’s substance use, this suggests that (Dutch) parents might be inclined to use less rules and restrictions when their child uses alcohol, or when their child grows older. Again, this finding may be specific for parents from West-European cultures, and may not hold for parents from non-western immigrant populations. Adolescent cannabis use, on the other hand, predicted an increase in perceived parental solicitation. As cannabis use is illegal for minors, whereas alcohol use was legal for adolescents aged 16 years and older at the time of data-collection, parents could react to cannabis use by increasing their monitoring.
activities. Given the finding that perceived parental solicitation also increased the likelihood of cannabis use, a reciprocal relation seems present. More specifically, parents may solicit more when they observe precursors of substance use, which is followed by actual substance use of their child. This may subsequently lead to increased solicitation in response to differences in their child’s behavior or friends observed by parents. However, results were limited to perceived parental solicitation by the adolescent, which suggests that adolescents who engage in cannabis use perceive solicitation by their parents as more intrusive, causing them to report higher levels of parental solicitation. As our study comparing native and immigrant Dutch adolescents also showed a positive relation between parental solicitation and cannabis use, this reciprocal association between parental solicitation and cannabis use might be similar for immigrant adolescents.

As mentioned before, we excluded the Islamic youngsters in the study comparing the association between parenting and substance use among native and immigrant adolescents because they reported very low levels of alcohol and cannabis use. In this group of 15-17 year olds, lifetime alcohol use was reported by 15.2%, and lifetime cannabis use was reported by 6.8% of the adolescents. This low level of substance use implies that those who have used alcohol or cannabis are more deviant than other substance users, and combining this group into the group of non-western immigrant youngsters would result in a heterogeneous group of substance users. An additional reason for excluding Islamic youngsters in this study is that it is difficult to separate the association between parenting and substance use from the association between affiliation with the Islam and substance use. As the Islamic religion prohibits the use of substances, it has an important protective role on substance use (El Marroun et al., 2008; Van Tubergen & Poortman, 2010). An Islamic affiliation of parents can also have a great effect on parenting behaviors. Franceschelli and O’Brien (2014) reported that Muslim parents use the Islam to guide their parenting behaviors. In our sample, Islamic youngsters reported significantly higher levels of parental control ($M = 3.53$) than native Dutch youngsters ($M = 3.07$). Franceschelli and O’Brien (2014) reported based on interview-data that parents explained their higher rate of parental control by their Islamic beliefs: Every action is reflected in this life and the next, even when parents are not around to watch over their children, there is always someone around. To be
able to provide prevention and intervention strategies that work for adolescents and young adults with an immigrant ethnic background, it is imperative that future research separately examines associations of risk and protective factors on substance use in sufficiently large groups of adolescents and young adults of diverse ethnic backgrounds, including those with Islamic beliefs and values.

The conclusions in this thesis pertaining to differences in associations between parental knowledge and substance use are consistent with the *no group differences* hypothesis (Rowe, Vazsonyi, & Flannery, 1994) which states that there may be differences in mean levels of traits, but that correlations between these traits are similar between native and immigrant groups. This hypothesis was also confirmed in a previous Dutch study by Wissink et al. (2006) who showed similar relations of several parenting practices and the parent-child relationship with various developmental outcomes, including self-esteem and aggressive behavior, in native and immigrant Dutch adolescents. It therefore seems that risk and protective factors regarding parenting have a similar relation with various outcomes in native and non-western immigrant Dutch adolescents, which could mean that, overall, theory and prevention strategies focusing on parenting are applicable to both populations. More research is necessary to examine whether this is also true for young Islamic immigrant adolescents.

**Measurement Bias in CUD Criteria**

In general, the present thesis indicates that past year DSM-IV CUD criteria seem to function similarly across different age groups and gender, while lifetime endorsement of CUD criteria showed bias across countries and gender. At similar levels of CUD, U.S. cannabis users were more likely than Dutch cannabis users to have a lifetime endorsement of the criteria legal problems, failed quit attempts, use despite problems, and withdrawal. Male cannabis users were more likely than female cannabis users to have a lifetime endorsement of the criteria hazardous use, legal problems, and tolerance. A lack of measurement invariance may result in imprecision in the diagnostics of CUD. The CUD criteria might have different meanings, or are interpreted differently across subgroups. The findings of the present thesis indicate that strong conclusions regarding prevalence differences of lifetime CUD between U.S. and Dutch, and male and female, cannabis users cannot
be drawn, because these could be due to differences in meaning or interpretation of the CUD criteria, instead of to real differences in CUD prevalence across groups.

Future research could also take into account different cultures that exist within one country. In the study on CUD criteria across different countries, we excluded immigrant cannabis users from both the U.S. and the Dutch sample to make the samples as comparable as possible. That is, immigrant groups in the U.S. differ from immigrant groups in the Netherlands, for instance with regard to historical background. Dutch immigrants mostly come from previously colonized countries moving to their former colonizing country, or were recruited for guest work on temporary work contracts. In the U.S., the majority population are European-Americans, who came to the U.S. since the 16th century, but also after WWI and WWII, for better financial or educational opportunities (Rumbaut, 1994). Large minority groups are African-Americans or Native Americans (i.e., Indians). African-Americans descent from slaves coming to the U.S. since the 16th century (Holt, 1997), and Native Americans are born in this country, and live in reservations (Luebering, 2010). Other minority groups such as Hispanics and Asians immigrated to the U.S. for better financial or educational opportunities (Gonzalez, 2011; Takaki, 1998).

An interesting next step would be to look at differences in endorsement of CUD criteria between native and immigrant cannabis users within a country. It is, for example, possible that in the Netherlands immigrant cannabis users are more likely to endorse certain criteria than native cannabis users. Because of their more tolerant attitude toward cannabis use, native Dutch cannabis users might judge a situation less quickly as harmful compared to immigrant Dutch cannabis users. For example, Terry and Wright (2005) showed that regular cannabis users and college students, who were considered to have a tolerant attitude toward cannabis use, thought that driving a car after smoking cannabis would not harm or influence their ability to drive. Similar to these findings, native Dutch cannabis users might consider driving after smoking cannabis as harmless and uninfluential to their ability to drive, while immigrant Dutch cannabis users might consider this behavior harmful. However, as suggested previously, acculturated immigrant cannabis users could show similar attitudes toward cannabis use as native Dutch cannabis users, making them more equal to native Dutch cannabis users on the likelihood of
endorsing hazardous use. Therefore, not only immigration status, but also acculturation status would be interesting to take into account.

Across gender, lifetime endorsement of CUD criteria showed measurement bias, while past year endorsement did not. The level of cannabis use is clearly different between a group of lifetime and past year cannabis users. By selecting past year cannabis users, more serious, experienced cannabis users are included, especially in the older age groups. This would result in a fairly homogeneous group of regular cannabis users. By selecting all lifetime cannabis users, also experimental cannabis users are included, yielding a heterogeneous group of experimental and regular users (Grant et al., 2006). Thus, prevalence differences in lifetime endorsement of CUD criteria between males and females should be interpreted with more caution than past year endorsement of CUD criteria. The latter may prove a more valid measure for comparison of prevalence rates, but is per definition restricted to a population of more regular cannabis users.

**Cannabis Involvement and Suicidal Thoughts and Behaviors**

The present thesis shows that cannabis involvement, i.e., cannabis use and endorsing CUD criteria, is associated with suicidal thoughts and behaviors, more specifically suicidal ideation and unplanned suicide attempt. In the literature, several explanations have been proposed for the relation of cannabis involvement with suicidal thoughts and behaviors. The impaired functioning theory proposes that physical, psychological, or emotional functioning is impaired by the use of cannabis, therefore increasing the risk of suicidal behaviors. Alternatively, according to the self-medication hypothesis, cannabis is used to reduce negative affective states, such as suicidal thoughts and behaviors. In addition, shared vulnerabilities could affect cannabis involvement on the one hand, and suicidal thoughts and behaviors on the other. In our study, the median age of first use of cannabis (18 years) coincided with suicidal ideation and preceded first suicide attempt with only one year. From this information, it could be speculated that it is most likely that cannabis involvement and suicide attempt occurred simultaneously, and thus the most likely explanation would be a third factor influencing both. For example, disinhibited or impulsive behavior could result in suicidal ideation and attempts without planning, as well as result in cannabis involvement. As suicidal thoughts and behaviors can cause great
harm, it is important to study the direction of the relation between cannabis involvement and suicidal thoughts and behaviors, and to examine common factors influencing both cannabis involvement and suicidal thoughts and behaviors, such as impulsivity. This way, specific and more effective prevention and intervention strategies for unplanned suicide attempts can be developed for cannabis users.

Suicidal thoughts and behaviors have been widely acknowledged to be related to depression. It is, therefore, possible that cannabis involvement is also related to depression. Indeed, a review article by Lev-Ran et al. (2014) suggests that cannabis involvement can predict later major depressive disorder and depressive symptoms. This has been partly explained by psychosocial failure, defined as educational failure (school dropout), occupational failure (persistent unemployment), or engagement in crime (Marmorstein & Iacono, 2011) among cannabis users. However, unplanned suicide attempters have been found to be less likely to report depressive symptoms than planned suicide attempters (Simon et al., 2002), which contradicts our findings, as cannabis involvement was not related to planned suicide attempts. Possibly, different factors affect the relation of cannabis involvement with depression and with unplanned suicide attempts, with cannabis involvement and depression being partly explained by adverse life events, and cannabis involvement and unplanned suicide attempts being explained by an impulsive personality. More research is needed to be able to make useful recommendations to clinicians about the need to screen for unplanned suicide attempts in people who use cannabis and endorse CUD criteria.

While the first part of this thesis reported mainly on adolescents and young adults, the study on cannabis involvement and suicidal thoughts and behaviors focused on adults aged 27 to 40 years. In adolescence, the increase in psychopathology such as mood disorders and substance use disorders could subsequently increase the risk of suicidal thoughts and behavior (Bridge, Goldstein, & Brent, 2006). A previous study in adolescents aged 14 to 18 years showed that initiation of cannabis use was related to suicidal ideation and attempts, especially in girls (Swahn et al., 2012), even when controlling for various confounders including other substance use, depressive mood, and violence victimization. As these researchers did not distinguish between planned and unplanned attempts, it is unclear if findings also diverge for planned versus unplanned attempts during
adolescence. More research on the distinction between planned and unplanned suicide attempts in adolescents is needed for effective prevention and intervention strategies.

Although in our sample of non-western immigrant adolescents we did not assess suicidal thoughts and behaviors, an interesting future study would be to look at the relation of cannabis use with suicidal thoughts and behaviors in non-western immigrants. Durkheim (1951) states that anomie, i.e. having ambiguous or changing social norms, could lead to feelings of a sense of hopelessness, which in turn could increase the risk of suicide. As Unger et al. (2004) suggest, growing up in two different cultures could be similar to this state of anomie, which could not only be related to an increased risk of suicide, but also to other maladaptive and escapist behaviors, such as substance use. An alternative explanation, which has been suggested by Van Leeuwen, Rodgers, Régner, and Chabrol (2010) is that those who reject the culture of origin are assertive and have a strong personality, which could protect against suicidal thoughts and behaviors. In the i4culture study, we have information on depressive symptoms that allows for the examination of the link between cannabis use and depression in future studies. Because this research area has hardly been studied, research on the relation of cannabis involvement with depression and suicidality in a non-western subpopulation is essential for effective prevention and intervention strategies.

**Strengths and limitations**

The present thesis includes some important strengths. A relatively large sample of immigrant adolescents and young adults, including youths from the five largest ethnic backgrounds in the Netherlands (i.e., Surinamese, Moroccan, Turkish, Antillean, and Asian), was used in three studies presented in this thesis, giving us a large amount of information on this population with respect to specific and general risk and protective factors for the use of cannabis. Also, important covariates were included in the questionnaire data, making it possible to take for example religiousness and alcohol/tobacco use into account. Another strength is the use of different data sets from the U.S. and the Netherlands, including U.S. and native Dutch cannabis users, using standardized and reliable diagnostic interviews. These data sets provide us with knowledge on differences between a country with an
illegal status of cannabis use (U.S.), compared to a country where the use of cannabis is depenalized (the Netherlands). A legal status of cannabis use could result in a more tolerant attitude towards cannabis use. It must be noted, however, that the illegal status of cannabis use in the U.S. is changing, with recent changes in Colorado and Washington, and recent decriminalization in states such as Oregon and Ohio, making interpretations in terms of legal or illegal status between the U.S. and the Netherlands more ambivalent.

The studies described in the present thesis should also be viewed in light of several limitations. Specific limitations of each separate study have been described in the previous chapters. Here, the more general limitations are discussed. There were some power limitations, with for example low lifetime use of cannabis among youths of Moroccan (11.5%) and Turkish (16.4%) origin, most of whom reported to be religiously affiliated with the Islam. To solve the power issue, we had to combine all groups into one non-western immigrant group, which hampers specificity of the significant relations across the various ethnic origins present in the Netherlands. Also, studies in the present thesis relied on self-report measures of substance use. This could result in social desirable answers, resulting in lower reports of substance use, therefore obscuring significant relationships. However, in the study on acculturation and past year cannabis use, similar results were found when accounting for social desirability with the Marlowe-Crowne social desirability scale (Crowne & Marlowe, 1960). This implies that social desirability did not affect the association of risk and protective factors with cannabis use in Dutch immigrant youths. Previous studies also concluded that, when anonymity is assured, self-report measures of substance use are reliable (Fendrich, 2004; Ramo, Liu, & Prochaska, 2012). It is less clear whether this also applies to immigrant youths, although research on immigrant subpopulations suggests that written questionnaires are more reliable than face-to-face interviews (Dotinga, van den Eijnden, Bosveld, & Garretsen, 2004). Another disadvantage of self-reported measures of substance use is recall bias. To reduce age-related recall bias, in our study on age differences in the measurement of DSM-IV CUD criteria, we selected past year instead of lifetime cannabis users.
Moreover, the cross-sectional design in some studies made it impossible to draw conclusions about the direction of the results. The cross-sectional study comparing native and immigrant adolescents on the association of the sources of parental knowledge and alcohol and cannabis use was expanded with a longitudinal analysis in native adolescents of the RADAR study. To confirm these results in immigrant adolescents, future research could examine longitudinal associations of the sources of parental knowledge with substance use in immigrant families. For example, as immigrant parents might be more strict on the use of substances by their offspring, it is possible that immigrant parents are more likely to use control parenting practices when their child uses alcohol and cannabis, while our longitudinal study suggested that native Dutch parents show lower levels of perceived parental control when adolescents use alcohol, and higher levels of perceived parental solicitation when adolescents use cannabis.

Last, another issue that became apparent in the present thesis, is the challenging work of combining different (secondary) data sets. Combining different data sets gives a unique opportunity to study similar relations across various subgroups. Factors that should be equal across data sets to have strong comparisons are: a) similar instruments, b) similar age groups, and c) similar covariates. When there are differences between data sets on any of these aspects, results should always be interpreted with caution. Secondary data sets should thus be selected on the basis of these similarities, to be able to make the best comparisons possible.

Implications
The findings of this thesis, although for a large part of theoretical relevance, also have some clinical implications. The finding that language use at home in combination with affiliation with cannabis-using peers is related to past year cannabis use indicates that the social environment plays a key role in relation to cannabis use. A clinical implication of the relation between language use at home and adolescent cannabis use is difficult, as more knowledge is needed on the mechanisms behind this relation. As previous studies showed, living in an acculturated family could also have positive outcomes, such as a bond with the neighborhood, better adaptation to the school environment, and thus better future opportunities (e.g., Andriessen & Phalet, 2002; Driessen & Smit, 2007; Oppedal,
Røysamb, & Sam, 2004). Affiliation with cannabis-using peers appeared to be positively related to both linguistic acculturation and cannabis use, indicating that prevention and intervention strategies targeted at peer interactions might be important.

This thesis showed that voluntary disclosure is an important protective factor for cannabis use in both western and non-western adolescents. A previous study by Tilton-Weaver et al. (2010) demonstrates that the reaction of parents on children’s disclosure can influence children’s subsequent disclosure, suggesting that parents can indirectly have an influence on their children’s substance use. Parent’s positive reactions, in terms of attempted understanding and warmth, were found to increase children’s disclosure, while parent’s negative reactions, in terms of emotional outburst, coldness, and negativity in reaction to disclosure, were found to decrease disclosure. Research on the effectiveness of increasing child disclosure in relation to subsequent substance use is necessary to make useful recommendations for parents.

The studies in the present thesis that focus on CUD criteria indicate that, because of measurement bias across these criteria in lifetime endorsement, comparisons in prevalence estimates between U.S. and Dutch, and male and female, cannabis users have to be considered carefully. Another important finding is that clinicians and health workers should be made aware of a possible relation of cannabis involvement with suicidal ideation and unplanned suicide attempts. More research is needed about the need to screen for suicidal ideation and unplanned suicide attempts in (problematic) cannabis users.

**Recommendations for future research**

For non-western immigrant subpopulations, it is imperative that future research focusses on longitudinal associations between risk factors such as acculturation and cannabis use. Previous studies on immigrant subpopulations have mainly been based on cross-sectional designs, which limits knowledge on the direction of the relations, and the mechanisms underlying cannabis use. Even when cross-sectional studies show similar results in native and immigrant populations, and longitudinal studies in native populations have established the direction of the relation, it is important to examine whether the same direction can be found in immigrant populations.
With the publication of DSM-5, future research should expand knowledge on the DSM-5 construct of CUD. All studies included in the present thesis focused on the DSM-IV criteria of cannabis abuse and dependence, while in the DSM-5, introduced in May 2014, the criterion legal problems has been excluded and withdrawal and craving were added. Previous studies already found evidence for a cannabis withdrawal syndrome (e.g., Budney, Vandrey, Hughes, Moore, & Bahrenburg, 2007; Verweij et al., 2013), and therefore, all datasets in this thesis included withdrawal. However, the withdrawal criterion used in the studies in this thesis was not a full equivalent of the DSM-5 withdrawal criterion because our data did not include all DSM-5 withdrawal symptoms. Craving as a new criterion needs further attention, including knowledge on measurement bias across different subgroups, such as gender, age, and country. For example, a recent study showed that craving had a higher rate of endorsement for male (18.5%) than for female (9.3%) cannabis users (Kubarych et al., 2014). This difference between men and women could represent a true difference between men and women, or could be due to measurement bias, making research on this criterion necessary. For strong statements about measurement bias, interview or questionnaire data with equal wordings across populations are necessary.

Finally, the relation of cannabis involvement with suicidal thoughts and behaviors should be given closer attention. Knowledge about the mechanism behind this relation, which is necessary for clinicians and health workers to be able to act upon their clients’ needs, is still unclear. Especially in light of the possible devastating consequences of suicidal thoughts and behaviors, research on effective preventive interventions is important.