



Published in final edited form as:

Clin Psychol Sci. 2013 January ; 1(1): . doi:10.1177/2167702612457599.

Key Characteristics of Major Depressive Disorder Occurring in Childhood, Adolescence, Emerging Adulthood, Adulthood

Paul Rohde,
Oregon Research Institute

Peter M. Lewinsohn,
Oregon Research Institute

Daniel N. Klein,
Stony Brook University

John R. Seeley, and
Oregon Research Institute

Jeff M. Gau
Oregon Research Institute

Abstract

This paper summarizes characteristics of major depressive disorder (MDD) in the Oregon Adolescent Depression Project, using data from 816 participants (56% female; 89% White). Contrasting four developmental periods (Childhood [5-12.9], Adolescence [13-17.9], Emerging Adulthood [18-23.9], Adulthood [24-30]), we examine MDD incidence/recurrence, gender, comorbidity, duration, and suicide attempts across periods. MDD first incidence was lower in Childhood compared to subsequent periods, and higher in Emerging Adulthood than Adulthood. Cumulative incidence was 51%. Recurrence was lower during Childhood than remaining periods, which were comparable. Female gender predicted first incident MDD in all four periods but was unassociated with recurrence. Comorbidity rates were comparable across periods. MDD duration was greater in Childhood than remaining periods. Suicide attempt rates were significantly higher during Adolescence than either Emerging Adulthood or Adulthood. Depression research should focus on MDD during Emerging Adulthood, adolescent suicidal behavior, the continuing role of gender into adulthood, and the ubiquity of MDD.

It is now well established that major depressive disorder (MDD) occurs in older adolescents at levels comparable with levels in adults, with point prevalence rates of approximately 2% in childhood and between 5 – 8% in adolescence and adulthood (e.g., Birmaher et al., 1996; Costello, Erkanli, & Angold, 2006; Kessler, Birnbaum, Bromet, Hwang, Sampson, & Shahly, 2010; Lewinsohn, Clarke, Seeley, & Rohde, 1994). Estimates of lifetime MDD prevalence in adolescents and young adults vary widely (a contentious issue that we will discuss in detail later), ranging from less than 9% (Tanner et al., 2007) to more than 30% (MDD and/or the much less common dysthymia; Hankin et al., 1998). Nationally representative surveys of adults suggest that the majority of individuals who will experience MDD do so by early adulthood (Kessler et al., 2005). In clinical populations, earlier onset of MDD is associated with greater functional impairments, psychiatric comorbidity, and

Correspondence concerning this article should be addressed to Paul Rohde, Ph.D., Oregon Research Institute, 1715 Franklin Blvd., Eugene, OR 97403-1983. paulr@ori.org.

Paul Rohde, Peter M. Lewinsohn, John R. Seeley, Jeff M. Gau, Oregon Research Institute, Eugene, OR; Daniel N. Klein, Department of Psychology, Stony Brook University, Stony Brook, NY.

suicidality (Zisook et al., 2007). Within five years of MDD onset, approximately 70% of child and adolescent patients will experience a recurrent episode (Kovacs et al., 1984; Rao et al., 1995). The majority of depressed adolescents appear to have lifetime psychiatric comorbidity, with rates of comorbid anxiety disorders being among the highest (30-80%); longitudinal studies estimate that 20-30% of depression adolescents will develop a substance use disorder (Birmaher et al., 1996). MDD is one of the most potent risk factors for suicidality (Lewinsohn, Rohde, & Seeley, 1994), and approximately 5-10% of depressed adolescents commit suicide within 15 years of their first MDD episode (Weissman et al., 1999). Although large longitudinal studies with children and adolescents have been conducted, several of which have followed research participants into adulthood (e.g., Copeland, Shanahan, Costello, & Angold, 2011; Fergusson, Boden, & Horwood, 2007; Moffitt et al., 2010; Tanner et al., 2007), questions remain regarding the degree to which MDD episodes vary across these developmental stages. The goal of this paper is to summarize the key characteristics of MDD episodes beginning in childhood through 30 years of age, using data from the Oregon Adolescent Depression Project (OADP; Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993). Given the timeframe of data collection in the OADP, we examine and contrast the key parameters of MDD across four developmental periods: (a) 5 – 12.9 years of age, which we refer to as Childhood; (b) 13 – 17.9 years of age, which we refer to as Adolescence; (c) 18 – 23.9 years of age, which we refer to as Emerging Adulthood; and (d) 24 – 30 years of age, which we refer to as Adulthood. To our knowledge, this type of analysis has never been reported across this broad an age span with the same sample of individuals.

Regarding our third developmental category, the term “Emerging Adult” was coined by Arnett (2000) and was proposed to represent a developmental period that is theoretically and empirically distinct from both adolescence and adulthood. This period is conceptualized as one of numerous choices and possibilities, in which the young person has much greater independence than in adolescence but has not yet assumed more longstanding responsibilities and commitments related to relationships, work, and even worldviews associated with adulthood. The period is proposed to have five unique features: (1) identity exploration, (2) trying out possibilities in love and work, (3) instability, (4) self-focus, and (5) feeling in-between adolescence and adulthood. As Arnett (2000) clearly notes, this developmental conceptualization of the lifespan is culturally constructed and probably applies most directly to young people in North America.

Data for this report come from the OADP, which began in the mid-1980s as a large, randomly selected cohort of high school students who were assessed at two points over a period of one year (T1 and T2) using questionnaires and structured diagnostic interviews, which assessed the lifetime occurrence of psychiatric disorders at T1 and the occurrence of psychopathology since the first interview at T2. A large subset of participants completed a third (T3) diagnostic interview after their 24th birthday and a fourth (T4) diagnostic interview occurred after participants turned 30 years of age.

A great deal of our previous research has focused on MDD, most extensively during adolescence, including data on prevalence, incidence, and recurrence (Lewinsohn et al., 1993); onset age, duration, and time to recurrence (Lewinsohn, Clarke et al., 1994); psychosocial risk factors for MDD (Lewinsohn, Roberts et al., 1994); and psychiatric comorbidity (Lewinsohn, Rohde, Seeley, & Hops, 1991; Rohde, Lewinsohn, & Seeley, 1991). We have reported on the natural course of MDD from adolescence to age 24 (Lewinsohn, Rohde, Klein, & Seeley, 1999) and the psychosocial predictors of MDD recurrence to age 24 (Lewinsohn, Rohde, Seeley, Klein, & Gotlib, 2000). Gender differences in the development and presentation of MDD among OADP participants were examined extensively in Essau, Lewinsohn, Seeley, and Sasagawa (2010). In that report, we

found that, over the entire T1-T4 time period, female participants had higher incidence rates of MDD and a greater total number of lifetime episodes than male participants. Gender differences in the duration of depressive episodes were marginally significant, with females having somewhat longer, but not significantly earlier, episodes. Given its clinical significance and strong association with MDD, a major interest area of ours has been on suicidal ideation and attempts in adolescents (Lewinsohn, Rohde, & Seeley, 1993; 1994; 1996; Lewinsohn, Rohde, Seeley, & Baldwin, 2001). The OADP has been the source of a large number of publications but the present study is the first OADP paper to examine and contrast core aspects of MDD episodes across these four key developmental periods. It is also the first OADP report to examine MDD in childhood in detail. Although this report does not aim to provide a comprehensive review of the large body of research on early-onset MDD, we believe the OADP has implications for understanding how the phenomenology, assessment, etiology, treatment and prevention of depression might vary or remain constant across these developmental periods. Research suggests that MDD has generally similar clinical manifestations in children and adolescents, including duration, severity, recurrence, and comorbidity (Birmaher et al., 2004) and that the clinical presentation, course, and familial aggregation of MDD in children, adolescents, and adults may have numerous similarities (Kovacs, 1996). However, research also has suggested noteworthy differences between depressed children, adolescents, and adults in neurobiological correlates (e.g., basal cortisol, corticotropin releasing hormone, serotonin probes), the individual's response to tricyclic antidepressant medications (Kaufman, Martin, Kind, & Charney, 2001), and risk factor profiles (Jaffee et al., 2002; Shanahan, Copeland, Costello, & Angold, 2011).

The specific goals of this report are to compare and contrast the presentation of MDD in Childhood, Adolescence, Emerging Adulthood, and Adulthood, as expressed by (1) rates of occurrence (first incidence, recurrence, total incidence); (2) the impact of gender on occurrence; (3) rates of comorbidity with anxiety disorders and substance use disorders (both unadjusted and controlling for disruptive behavior disorders, which may reduce or eliminate associations with depression; Compton, Thomas, Stinson, & Grant, 2007); (4) duration of episodes; (5) degree to which MDD in a prior developmental period predicts subsequent MDD; and (6) rates of suicide attempts.¹ We also provide lifetime rates through age 30 of these phenomena. We conclude by extrapolating from the current findings to posing critical questions and research directions to advance the understanding of depression in young people.

Method

Brief Description of the OADP

Participants were randomly selected in three cohorts from nine senior high schools representative of urban and rural districts in western Oregon. Data collection was completed at four time points. We summarize data collection across the entire study; additional details regarding the OADP are reported elsewhere (e.g., Lewinsohn et al., 2003a, 2003b; Pettit, Lewinsohn, & Joiner, 2006; Rohde et al., 2007). A total of 1709 adolescents completed the T1 interview and questionnaires between 1987 and 1989; the overall participation rate was 61%. About half of the T1 sample (53%) was female, with an average age of 16.6 years (range 14-19; $SD = 1.2$). A total of 9% were non-White or Hispanic and 53% were living with two biological parents. Approximately one year later ($M = 13.8$ months, $SD = 2.3$), all T1 participants were invited to complete a second (T2) assessment. A total of 1507

¹Data on bipolar disorder are not included in this report, given its relative infrequency in the general population and our previous research on the topic (e.g., Lewinsohn, Klein, & Seeley, 2000).

participants (88%) returned for a re-administration of the questionnaire and interview assessments.

Between 1994 and 1999, as participants reached their 24th birthday, a third wave of questionnaires and interviews (T3) was obtained from 941 participants with a history of psychopathology at T2 ($N = 555$; 315 with depression, 240 with other psychopathology) and a randomly selected subset of participants with no history of mental disorder ($N = 386$) (Lewinsohn et al., 2003). 85% of participants invited for the T3 assessment participated. Lastly, as participants reached their 30th birthday, a fourth wave of questionnaires and interviews (T4) was conducted with all participants who completed T3. 816 participants (87% of the 941 at T3) completed the T4 assessments, and this group comprises the sample for the present report.

Of these 816 individuals, 480 (59%) were women. Most participants were White (89%); others were African American (1%), Hispanic (3%), American Indian (3%), Asian (3%), and “other” (2%). Slightly more than half (53%) were married, and 41% had a bachelor's degree or higher. Participants' mean T4 age was 30.6 years ($SD = 0.6$). Written informed consent was obtained from participants (and guardians, if applicable).

Diagnostic Interviews

At T1 and T2, participants were interviewed with a version of the Schedule for Affective Disorders and Schizophrenia for School-Age Children (K-SADS; Orvaschel, Puig-Antich, Chambers, Tabrizi, & Johnson, 1982), which combined features of the Epidemiologic and Present Episode versions, and included additional items to derive Diagnostic and Statistical Manual of Mental Disorders, 3rd edition revised (DSM-III-R; American Psychiatric Association, 1987) diagnoses. The T1 interview probed for the occurrence of lifetime psychopathology, which was defined as occurring no earlier than five years of age; subsequent interviews probed for psychopathology occurring since the previous interview. Follow-up assessments at T2 and T3 were jointly administered with the Longitudinal Interval Follow-Up Evaluation (LIFE; Keller et al., 1987). The K-SADS/LIFE procedure provided information regarding the onset (recorded in months of age) and duration (recorded in weeks) of all major psychiatric disorders (MDD, dysthymia, bipolar, anxiety [panic, agoraphobia, social phobia, simple phobia, obsessive-compulsive, separation anxiety, overanxious], disruptive behavior [ADHD, conduct, oppositional defiant], substance use [abuse and dependence, all major psychoactive substances], eating, and adjustment) since the previous interview. MDD recovery was defined using LIFE criteria of 8 or more consecutive weeks of no or minor symptoms, and recurrence was defined as meeting full MDD criteria following recovery; both of these terms follow consensus definitions (Frank et al., 1991). The T4 interview consisted of a joint administration of the LIFE and the Structured Clinical Interview for DSM-IV (SCID; First, Spitzer, Gibbon, & Williams, 1997) to probe for new or continuing episodes since T3. Diagnoses were based on DSM-III-R criteria for T1-T2 and DSM-IV (American Psychiatric Association, 1994) criteria for T3-T4. Interviews at T3 and T4 were conducted by telephone, which we previously found yielded comparable results to face-to-face interviews for major depressive, anxiety, and substance use disorders, although poor agreement for adjustment disorders (Rohde, Lewinsohn, & Seeley, 1997).

Diagnostic interviewers were carefully selected, trained, and supervised. Interviewers had degrees in a mental health discipline and completed a 70-hour course in diagnostic interviewing. Interviewers were required to demonstrate a minimum kappa of 0.80 across all symptoms for at least two consecutive training interviews and on one videotaped interview of a participant with evidence of psychopathology before conducting interviews. Interviewer performance was carefully monitored to maintain reliability. We previously reported that

inter-rater reliabilities ($n = 263$ at T1; 162 at T2; 190 at T3; and 124 at T4) indicated good to excellent agreement for both MDD ($k = .81-.86$) and nonmood disorders ($k = .76-.89$) (Rohde, Lewinsohn, Klein, & Seeley, 2005; Seeley, Kosty, Farmer, & Lewinsohn, 2011).

Suicide attempts

Suicidal behavior was assessed via the depression section of the K-SADS and SCID. We did not, however, record in the K-SADS/SCID the specific ages at the time of suicide attempts. Therefore, we report suicide attempts as a function of their occurrence during a specific study assessment: Adolescent attempts occurring prior to T2 (mean T2 age = 17.8 years), Emerging Adult attempts occurring between T2-T3 (mean T3 = 24.6 years), and Adult attempts occurring between T3-T4 (mean T4 age = 30.6 years). To determine whether suicide attempts reported at T1 had occurred in Childhood versus Adolescence, we reviewed the clinical write-ups that accompanied the K-SADS interviews for the subset of participants who both Childhood MDD and a lifetime suicide attempt at T1 to ascertain whether the attempt had occurred prior to age 13 (present for 5 participants). During the period prior to T2, a total of 230 suicide attempts were reported by 86 participants; at T3, 63 suicide attempts were reported by 35 participants; and at T4, 59 suicide attempts were reported by 23 individuals.

Statistical Procedures

Descriptive statistics and corresponding 95% confidence intervals were used to describe rates of MDD (first incidence, recurrence, and total incidence), duration of MDD episodes, and rates of suicide attempts during the four developmental periods. Binary logistic regression models with odds ratios and corresponding 95% confidence intervals were used to test gender as a predictor of rates of MDD and to test for differences in period comorbidity of MDD with anxiety and substance use disorders during the three developmental periods. Given the high comorbidity between substance use disorders and disruptive behavior disorders (e.g., Armstrong & Costello, 2002) and the possibility that controlling for disruptive behavior disorders eliminates an association between MDD and substance abuse/dependence (Compton et al., 2007), we examined comorbidity with substance use disorders both unadjusted and controlling for the lifetime presence of disruptive behavior disorders (diagnosed in 6% of the sample). As participants with no history of psychopathology were undersampled in the T3 follow-up, participants were weighted as a function of the probability of selection at T3 in all analyses comparing outcomes across the three developmental periods. Design weights were used and analyses with robust variance estimator run using software that accommodated samples not randomly selected (i.e., STATA). Effect size conventions for odds ratios greater than 1.0 are: 1.48 = small, 2.48 = medium, and 4.28 = large. Effect size conventions for odds ratios less than 1.0 are: 0.68 = small, 0.40 = medium, and 0.23 = large (Lipsey & Wilson, 2001).

Results

Incidence Rates of MDD in the Four Developmental Periods

Table 1 illustrates three categories of MDD incidence, which were examined in each of the developmental periods. *First incidence* indicates the proportion of first episode of MDD per developmental period. The denominator for the Child period (5-12.9 years) was all 816 participants; for the Adolescent Period (13-17.9 years) it was 763 participants (816 minus the 53 first incidence cases of Childhood); for the Emerging Adult period (18-23.9 years) it was 562 participants (i.e., 816 minus the 254 previous first incidence cases); and for the Adult period (24-30 years) it was 410 (i.e., 816 minus first incidence cases in the three earlier periods). *Recurrence* represents the proportion of participants with a history of MDD in a previous developmental period that developed a new episode of MDD in a subsequent

period (or the proportion that experienced two MDD episodes during the Child period). The denominator for both the Child and Adolescent period was the number of first incidence cases at the 5-12.9 year period (denominator for the remaining two periods was the total number of first incidence cases in previous developmental periods). *Total incidence* represents the number of cases in a developmental period with either a first incidence or recurrence.

As can be seen by comparing confidence intervals in Table 1, significant differences emerged for the three incidence measures across the four developmental periods. Rates of MDD first incidence were significantly lower in Childhood compared to all subsequent periods. Rates in Adolescence were comparable to both Emerging Adulthood and Adulthood, with higher first incidence in Emerging Adulthood compared to Adulthood. Parenthetically, the first incidence MDD cases in Childhood did not occur solely near the end of that developmental period: 38% of episodes occurred between 5-9 years of age; 13% at age 10, 23% at age 11, and 26% at age 12. Regarding MDD recurrence, rates were significantly lower during the Child period compared to all subsequent periods, which did not differ. Lastly, the total incidence rate of MDD was significantly lower in the Child period compared to the Adolescent period, which in turn was significantly lower than both Emerging Adult and Adult periods.

The total cumulative weighted incidence of MDD through age 30 for the study sample was 51% ($n = 477$), 95% $CI = 47.1 - 54.5$. Among participants who had ever experienced MDD, the total cumulative MDD recurrence rate was 53% (95% $CI = 47.9 - 57.4$). Among the entire (unweighted) T4 panel, 42% did not experience MDD, 32% had MDD during a single developmental period, 17% had MDD episodes in two developmental periods, and 9% experienced MDD in each of the developmental periods.

Effects of Gender on MDD across Developmental Periods

We next examined whether the three incidence rates of MDD (i.e., first incidence, recurrence, and total) in the four developmental periods were associated with gender (56% of the sample was female). Univariate logistic regression models were used to test whether gender (1 = female, 0 = male) predicted the rates of MDD in the Child, Adolescent, Emerging Adult, and Adult periods. Table 2 shows the associated odds ratio and 95% confidence intervals for first incidence, recurrence, and total incidence. As can be seen, female gender was consistently associated with first incidence MDD in all four developmental periods. This effect was medium in magnitude and comparable across developmental periods. The pattern of gender for total incidence paralleled results for first MDD incidence. Regarding recurrence, although the odds of MDD recurrence in adolescence was higher for women (OR = 6.08 vs. less than 1.3 for remaining periods), female gender failed to predict recurrence in any developmental period and the direction of the association was reversed in the Child period relative to other periods.

Comorbidity with MDD across Developmental Periods

Table 3 illustrates the period prevalence of comorbidity of anxiety and substance use disorders with MDD episodes occurring in the Child, Adolescent, Emerging Adult, and Adult developmental periods. Unadjusted associations of MDD with substance use disorders were examined first, followed by associations controlling for the lifetime presence of a disruptive behavior disorder. As can be seen, significant comorbidity with both anxiety and substance use disorders occurred in each of the four periods. Interestingly, the magnitude of comorbid associations across all four periods was quite comparable; odds of anxiety disorders during a developmental period were approximately four times greater given MDD, and did not significantly differ across periods. The odds of a comorbid substance use

disorder were significantly greater given MDD during Childhood relative to both Adolescence and Emerging Adulthood period in the unadjusted associations, presumably due to the very low prevalence of substance abuse/dependence among children who did not have MDD. Controlling for disruptive behaviors disorders, the magnitude of comorbidity between MDD and substance use disorders remained highly significant but no longer differed across the four developmental periods. Examining total lifetime comorbidity rates given any occurrence of MDD through age 30, MDD exhibited significant comorbidity with lifetime anxiety disorders (32% given MDD vs. 9% given no MDD); $OR = 4.65$; 95% $CI = 3.09 - 7.01$; $p < .001$; and substance use disorders (48% given MDD vs. 32% given no MDD); $OR = 1.94$; 95% $CI = 1.43 - 5.62$; $p < .001$).

Duration of MDD Episodes

The mean (SD), range, and median duration of MDD episodes occurring in each of the four developmental periods are shown in Table 4. Episode durations were highly skewed (e.g., 2-829 weeks during Adolescence) with a median duration value ranging from 8 weeks in Adolescence to 16 weeks in Childhood. As can be seen in Table 4, although MDD during Childhood was infrequent, episodes that occurred so early had a significantly longer duration compared to all three subsequent periods.

Regarding the total number of MDD episodes through age 30, 42% of the sample had no MDD episodes, 25% had 1 MDD episode, 16% had 2 episodes, 8% had 3 episodes, 6% had 4 episodes, 2% had 5 episodes, and 2% had 6 or more MDD episodes. The mean duration of MDD episodes occurring at any point up to age 30 was 27.7 weeks, 95% $CI = 24.0 - 31.4$, median = 11 weeks, range = 2 - 829 weeks. Given that most participants with one MDD experienced a recurrent episode by age 30, we computed a cumulative duration of time in an MDD episode through age 30. Among participants who experienced MDD, the mean duration of ill-time across all episodes, across all developmental periods was 54.6 weeks, $SE = 3.87$, 95% $CI = 47.0 - 62.2$, median = 25 weeks, range = 2 - 877 weeks.

MDD in Adolescence, Emerging Adult and Adult Periods as a Function of Prior MDD

We next examined the degree to which experiencing an MDD episode during an earlier developmental period impacted the risk of an MDD episode during a subsequent developmental period. We examined rates of MDD in Adolescence as a function of MDD in Childhood, Emerging Adulthood as a function of MDD in either Childhood or Adolescence, and Adulthood as a function of MDD in Childhood, Adolescence, or Emerging Adulthood. As expected, a previous MDD episode significantly increased the risk of having an MDD episode in future periods. During Adolescence, the probability of MDD given a Childhood MDD (i.e., recurrence) was 38%, compared to a first incidence MDD rate of 19%; $OR = 2.23$, 95% $CI = 1.29 - 3.97$, $p < .01$. During Emerging Adulthood, the probability of MDD given an MDD episode during Childhood or Adolescence was 46%, compared to a first incidence MDD rate of 24%; $OR = 2.67$, 95% $CI = 1.90 - 3.65$, $p < .001$. During Adulthood, the probability of having an MDD episode given a prior MDD episode during either Child, Adolescent, or Emerging Adult periods was 43%, compared to a first incidence rate of 16%; $OR = 3.88$, 95% $CI = 2.76 - 5.45$, $p < .001$. Thus, a prior MDD episode more than doubled the likelihood of having an MDD episode in Adolescence and Emerging Adulthood and increased the probability of an MDD episode in Adulthood almost fourfold, which is consistent with the significant decrease in first incidence rates after age 24.

MDD and Suicide Attempts

As noted earlier, the occurrence of suicidal ideation and suicide attempts has been areas of particular interest (Andrews & Lewinsohn, 1992; Lewinsohn, Rohde, & Seeley, 1993, 1994b, 1996; Lewinsohn, Rohde, Seeley, & Baldwin, 2001; Rohde et al., 1997). In this

paper, we focus on differences in the occurrence of suicide attempts given MDD in the four developmental periods. As can be seen in Table 4, rates of suicide attempts were significantly higher during the Adolescent period compared to both the Emerging Adult and Adult periods, which did not differ.

We were interested in gender differences in suicide attempt rates with MDD across developmental periods. Results for suicide attempts by female and male participants with MDD in each developmental period are also shown in Table 4. Rates for females with MDD were significantly higher during the Adolescent period compared to both Emerging Adult and Adulthood, with an intermediate rate for girls in Childhood. Rates for males in Adolescence, Emerging Adulthood, and Adulthood did not significantly differ (gender differences could not be tested in Childhood because no male made a suicide attempt during this period).

Among participants with a history of MDD through age 30, 19% (95% CI = 16.0 – 22.9) had at least one suicide attempt by the T4 interview. This rate of attempts was significantly higher than the rate for participants without a history of MDD through the age of 30 (3%, 95% CI = 1.6 – 5.1), $\chi^2(1,816) = 55.62, p < .0001$. A history of MDD through the age of 30 increased the likelihood of suicide attempt eightfold ($OR = 8.02$; 95% $CI = 4.3 – 15.0$).

Discussion

The paper presents data from an important longitudinal study of depression which has made a significant contribution to our understanding of adolescent depression by providing critical information about prevalence, duration, course, patterns of comorbidity, and longer term sequelae of early depression as the sample was followed into adulthood. Strengths of the OADP include its rigorous methodological design, strong retention of participants, and lengthy follow-up period. The present paper contrasted the core indices of MDD across four markedly diverse developmental periods. This has never been done with the OADP data set or, to our knowledge, with any other longitudinal data set. Numerous data are presented in the present report. Rather than review all results, our goal in this discussion is to highlight what we believe are the most novel and important findings and resulting critical directions for future research.

Probably the first factor in this study that warrants discussion is the apparent ubiquity of MDD; over half of our sample by age 30 had experienced an episode of MDD. This rate is markedly greater than estimates from cross-sectional retrospective studies (e.g., 17-19%; Kessler et al., 1994; 2005). However, it is more consistent with several prospective, multi-wave studies that began in childhood or adolescence (e.g., 41% by age 32 in the Dunedin Study; Moffitt et al., 2011; 31% by age 20 in the Simmons Longitudinal Study; Tanner et al., 2007; 26% by age 34 in the Early Developmental Stages of Psychopathology study; Beesdo, Höfler, Leibenluft, Lieb, Bauer, & Pfennig, 2009), although other multi-wave studies have reported lower lifetime MDD prevalence rates (e.g., 12% by age 24; Wittchen, Nelson, & Lachner, 1998; 14% by age 21; Copeland et al., 2011). There are four factors that may account for the high lifetime MDD prevalence rate in the OADP: (1) the use of repeated assessments, (2) the full review of past periods, (3) the use of semi-structured rather than structured interviews, and (4) K-SADS and SCID definitions for MDD symptom thresholds.

As noted above, lifetime prevalence rates of psychopathology are much higher when aggregated across multiple assessment waves in prospective longitudinal studies compared to cross-sectional studies with a single retrospective assessment (Moffitt et al., 2010; Olino et al., in press). Differences are particularly pronounced for episodic conditions, such as

MDD, compared to more chronic disorders (Olino et al., in press). These findings suggest that cross-sectional studies probably underestimate prevalence due to underreporting of past psychopathology, particularly briefer and milder episodes (Moffitt et al., 2010; Olino et al., in press).

Two other factors that might account for the lower rates in previous research are the lack of complete coverage of the lifespan and the use of structured diagnostic interviews. For example, participants in the Dunedin Study (Moffitt et al., 2011) were assessed at 18, 21, 26, and 32 years of age but the reporting period at each assessment point was only the past 12 months, which left fairly large gaps in the assessment windows and probably underestimated cumulative prevalence. Other studies have also not attempted to assess the entire time period at repeated assessments, such as the Great Smokey Mountain Study, which they note resulted in likely underestimates of lifetime prevalence (Copeland et al., 2011). Regarding the nature of the interview, the K-SADS and SCID interviews are semi-structured diagnostic procedures, which allow the interviewer to probe for understanding and accuracy, whereas all other multi-wave studies of depression in young people appear to have used structured diagnostic interviews. Longterm prevalence estimates from structured interviews are often conservative relative to estimates from semi-structured interviews (Haro et al., 2006). The ability to verify understanding and interpretation of diagnostic probes may be more important when assessing internalizing disorders such as MDD in adolescents than adults.

The last factor that may have contributed to differentially higher rates of depression in the OADP is how the diagnostic criteria for MDD were operationalized. Although diagnostic interviews are often based on the same criteria (e.g., DSM-IV), the criteria may be operationalized differently. For example, the DSM-III-R and DSM-IV MDD core symptom of depressed mood requires “depressed mood most of the day nearly every day.” This is operationally defined in the K-SADS as “depressed mood most days (at least 4/week), over 50% of awake time.” Other interviews may use higher thresholds to assess this item, resulting in lower prevalence rates. While we often assume that studies are comparable because they use similar diagnostic criteria, we may overlook the fact that minor differences in the wording of probes and anchors can have a substantial influence on prevalence rates (Pilkonis, Heape, Ruddy, & Serrao, 1991).

The frequency of MDD has far-reaching implications. For one thing, it suggests that one-shot retrospective assessments typical in most research studies are probably erroneous. Most importantly, a significant proportion of participants classified as “non-depressed controls” in lifetime retrospective studies of adults probably have a history of depression. Thus, there is a pressing need for more sensitive assessment and for more intensive assessment designs. From a conceptual perspective, the high prevalence rates raise critical questions about how we conceptualize psychopathology (e.g., is it really “abnormal” from a statistical perspective? are the diagnostic criteria for MDD are too liberal?).

Looking at MDD episodes across the entire 30 year period, the median duration was 11 weeks, which is consistent with large nationally representative adult samples (Eaton et al., 2008; Kessler et al., 2010). This suggests that a large number of MDD episodes in community samples resolve relatively quickly, generally without intervention. It was intriguing that the longest MDD durations in this paper were reported for childhood episodes, which were based on reports obtained in mid/late adolescence. Indeed, these are the only rates that were based on reports from a different developmental period. Childhood MDD episodes may truly tend to be longer or it may be that shorter MDD episodes in childhood were forgotten by the T1 assessment. Consistent with this second possibility, although not statistically different, the median duration for MDD episodes in adolescence, which was the only developmental period in which we conducted two assessments and

hence covered shorter reporting periods, appeared somewhat shorter than episodes in both emerging adulthood and adulthood (i.e., 8 vs. 12 weeks).

One response to the possible concern of “over-diagnosis” would be to increase the duration and/or threshold for MDD (Klein, Shankman, & McFarland, 2006). However, we know from numerous studies (e.g., Lewinsohn, Shankman, Gau, & Klein, 2004; Lewinsohn, Solomon, Seeley, & Zeiss, 2000) that subthreshold conditions are associated with significant problems in functioning and increased risk for future pathology. Again, however, it may be that it is persistent or recurrent subthreshold depression, rather than subthreshold depression in general, that accounts for most of this impairment and risk (Klein, Shankman, Lewinsohn, & Seeley, 2009). Rather than changing the diagnostic criteria, another method for narrowing the focus to more severe cases of MDD would be to limit study to the subset of depressed adolescents who receive treatment. Compared to community samples, clinical samples of depressed children and adolescents have an earlier age of onset, longer episode duration, higher rates of recurrence, sustained impairments across a broad range of life domains, and greater likelihood of psychiatric comorbidity and suicidality (e.g., Dunn & Goodyer, 2006; Harrington, Fudge, Rutter, Pickles, & Hill, 1990; Kovacs, Feinberg, Crouse-Novak, Paulauskas, & Finkelstein, 1984a, Kovacs et al., 1984b). Although there are restrictions and selection biases on who seeks and has access to mental health treatment, the study of patient samples probably has the most direct relevance to the clinicians who are interested in providing care to this population.

A fairly novel aspect of the present report was the examination of Emerging Adulthood as a unique developmental period. The occurrence of MDD appears to be markedly associated with this developmental period, with first incidence rates still as high as in adolescence (and significantly higher than the subsequent adulthood period) combined with a high MDD recurrence rate. Thus, we recommend that a primary focus of MDD research be on the period of Emerging Adulthood, with a goal of (a) reducing first incidence rates, and (b) reducing recurrence rates, most likely through the use of selective or indicated prevention strategies. Using a slightly different age period classification strategy, Hammen, Brennan, Keenan-Miller, and Herr (2008) found youth who experienced both initial MDD prior to age 18 and recurrence prior to age 20 to be a particularly high-risk group, with more severe and chronic depressive episodes, more frequent suicidality and comorbid anxiety disorders, and poorer psychosocial functioning, compared to both participants who experienced a single MDD episode either in adolescence or the emerging adult period.

The concept of emerging adulthood is somewhat controversial and some contend that it is better conceptualized in terms of economic conditions rather than a psychological developmental period per se (e.g., Côté & Bynner, 2008). Regardless, it is a period in which there are significant stressors (lack of structure, relationship instability, lack of economic independence, uncertainty about the one's competence and future) that may, in part, explain the elevated rates of MDD. In addition, this period is hypothesized to involve increased self-focus. In the integrative theory of depression (Lewinsohn, Hoberman, Teri, & Hautzinger, 1985), a heightened state of self-awareness was thought to break through an individual's self-protective, self-enhancing cognitive schema (Alloy & Abramson, 1979), leading to self-denigration and behavioral withdrawal.

The present findings suggest that the field of depression research may have overemphasized the importance of adolescence in understanding the onset of depression and neglected the arguably more important period of emerging adulthood. For example, although there is currently a great deal of interest in the neurobiology of adolescence, trajectories of neural development often continue well into young adulthood (e.g., Dosenbach et al., 2010; Tamnes et al., 2010). Hence, a detailed exploration of the neurobiology of young adulthood

is also warranted. In addition, there is a growing focus on active outreach efforts to prevent and treat depression on college campuses (e.g., Garlow et al., 2008). Our data strongly support these efforts.

Our next recommended area of research focus is to understand suicidal behavior in adolescence. The present results are the first time we have contrasted rates of suicide attempt across the four examined developmental periods and findings illuminate a markedly elevated rate of attempts during the Adolescent period compared to both the Emerging Adult and Adult periods. Suicidal behaviors in association with MDD are exceptionally frequent during this developmental period, with one fifth of depressed adolescents reporting a suicide attempt, which was two to four times higher than the rates of attempts given MDD occurring in either Emerging Adulthood or Adulthood. Suicide attempts among female adolescents were primarily driving this effect: rates of attempt were significantly higher for female adolescents compared to women in later developmental periods. Adolescence in general is known to be a high risk period for suicide attempts (e.g., Kessler, Borges, & Walters, 1999) and a few studies of patient samples have found that MDD during adolescence is more strongly associated with suicide attempts than adult-onset MDD (van Noorden et al., 2011; Zisook et al., 2007). However, others have reported with patient samples that the association of suicide attempts increases with age from adolescence to adulthood (Goldston et al., 2009) or is more strongly associated with recurrent MDD (Witte, Fink, Smith, & Joiner, 2009), which is more likely to occur later than adolescence. Research should study the long term consequences of adolescent attempts and distinguish attempts from non-suicidal self-injury (i.e., intentional and non-socially sanctioned self-inflicted damage without suicidal intent) which has been proposed as a new disorder for DSM-V.

Our last recommended research focus is gender. First incidence MDD rates are roughly 2.5 times greater in women from childhood through age 30. Interestingly, that association pertained to first incidence (significant in all four periods) but not recurrence. Gender differences in the rate of depression among adults have been reported many times, with a typical ratio of 2:1 (e.g., Nolen-Hoeksema & Girgus, 1994) and other studies of both adolescents (Hankin et al., 1998; Kovacs et al., 2001) and adults (Eaton et al., 2008; Kessler et al., 1994) have reported higher rates of first incidence for females than males. In addition, most studies (e.g., Hankin et al., 1998; Eaton et al., 2008; Kovacs, 2001) find no significant gender effect for MDD recurrence, although a few studies with adolescents (Dunn & Goodyer, 2006; McCauley et al., 1993) and with adult patients (Mueller et al., 1999) have found greater depressive recurrence for women. Definitely answering the question of whether or not female gender increases the risk for MDD recurrence at any developmental period or for any subgroups of the population is a critical gap in our knowledge base. The most novel aspect of the present study is to highlight the fact that the increased incidence of MDD is not exclusively an issue of early-mid adolescence, as is generally assumed. While the MDD gender difference may emerge in adolescence, it persists well into adulthood. Hence, research on gender differences in depression needs to expand its focus. It is important to explore whether there are gender differences in stable vulnerability factors even before adolescence that may help explain why risk continues to persist (e.g., Kujawa, Torpey, Kim, et al., 2011). In addition, given the preponderance of women experiencing first incidence MDD, gender-specific prevention interventions through adulthood, rather than simply focusing on adolescence, are necessary (Le, Muñoz, Ippen, & Stoddard, 2003).

MDD has been variously conceptualized as an episodic/remitting condition and as a chronic/recurrent condition (Keller & Boland, 1998; McCauley et al., 1993). Consistent with Monroe & Harkness (2011), our data suggest that it is actually both. Among OADP participants who had ever experienced MDD, the total cumulative MDD recurrence rate was 53%. The high recurrence rate has implications for prevention efforts. A strong case could

be made that there needs to be a greater emphasis on depression recurrence prevention, as opposed to the prevention of first incidence onset. However, given the heterogeneity of MDD, course patterns may provide clues to different subtypes. For example, there is evidence that etiological influences may differ for single episode vs recurrent and remitting versus chronic depressions (Klein, 2008; Uher et al., 2011).

Before concluding, study limitations should be acknowledged. Although based on a large sample of community-residing adolescents, several factors may limit the generalizability of our findings. First, the sample was restricted to a single geographical location of the US. The extent to which different findings might have emerged from a national probability sample or from samples from other regions of the US or world is unknown. Second, and related to the first limitation, the sample was predominantly of European-American descent. Although the racial and ethnic composition of the OADP was comparable to the region from which participants were recruited (Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993), the sample was not representative of the ethnic and racial composition of the entire US. As there are differences in prevalence and course of MDD in different ethnic groups, the generalizability of our findings may be limited (Williams et al., 2007). A third limitation is that we did not collect Tanner stage data to ascertain pubertal timing or status, which may have provided a more relevant classification of early MDD episodes than age per se (Angold, Costello, & Worthman, 1998). Fourth, the sample suffered some attrition at each assessment.

When data collection in the OADP began in 1987, almost all of the available information on adolescent depression came from small patient samples or questionnaire-based surveys. Partially as a result of the OADP, the pervasiveness and significance of MDD in adolescence is now well-established. The present paper took the entire data set and expanded our focus to compare and contrast MDD across four markedly diverse developmental periods. Results suggest that MDD in childhood is unique in terms of a lower occurrence but also possibly greater episode duration. Adolescent MDD is unique in its high rates of suicide attempts, although it is possible that many of these episodes may be of short duration. Emerging adulthood warrants further study as a separate developmental period for depression researchers given its elevated rates of MDD relative to adults, but the presentation of MDD in this age period (e.g., gender associations, psychiatric comorbidity, duration, and rates of suicidality) is generally comparable to adults 24-30 years of age. Longitudinal studies of community samples that continue into adulthood, such as the OADP, have provided essential information. However, this review also points to the kinds of future research topics and designs that are needed to make further progress.

Acknowledgments

This research was supported in part by NIMH grants MH40501, MH50522, and NIDA grant DA12951 awarded to Dr. Peter Lewinsohn. We wish to thank Frédéric Brière, Ph.D, for his assistance in preparing the revision to this manuscript.

References

- Alloy LB, Abramson LY. Judgment of contingency in depressed and nondepressed students: Sadder but wiser? *Journal of Experimental Psychology: General*. 1979; 108:441–485. [PubMed: 528910]
- American Psychiatric Association. *Diagnostic and statistical manual of mental disorders, third edition-revised (DSM-III-R)*. Washington, DC: American Psychiatric Association; 1987.
- American Psychiatric Association. *Diagnostic and statistical manual of mental disorders, fourth edition (DSM-IV)*. Washington, DC: American Psychiatric Association; 1994.

- Andrews JA, Lewinsohn PM. Suicidal attempts among older adolescents: Prevalence and co-occurrence with psychiatric disorders. *Journal of the American Academy of Child & Adolescent Psychiatry*. 1992; 31:655–662. [PubMed: 1644728]
- Angold A, Costello EJ, Worthman CM. Puberty and depression: The roles of age, pubertal status and pubertal timing. *Psychological Medicine*. 1998; 28:51–61. [PubMed: 9483683]
- Armstrong TD, Costello EJ. Community studies on adolescent substance use, abuse, or dependence and psychiatric comorbidity. *Journal of Consulting and Clinical Psychology*. 2002; 70:1224–1239. [PubMed: 12472299]
- Arnett JJ. Emerging Adult: A theory of development from the late teens through twenties. *American Psychologist*. 2000; 55:469–480. [PubMed: 10842426]
- Beesdo K, Höfler M, Leibenluft E, Lieb R, Bauer M, Pfennig A. Mood episodes and mood disorders: Patterns of incidence and conversion in the first three decades of life. *Bipolar Disorder*. 2009; 11:637–649.
- Birmaher B, Ryan ND, Williamson DE, et al. Childhood and adolescent depression: A review of the past 10 years. Part 1. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1996; 35:1427–1439. [PubMed: 8936909]
- Birmaher B, Williamson DE, Dahl RE, Axelson DA, Kaufman J, Dorn LD, Ryan ND. Clinical presentation and course of depression in youth: Does onset in childhood differ from onset in adolescence? *Journal of the American Academy of Child & Adolescent Psychiatry*. 2004; 43:63–70. [PubMed: 14691361]
- Compton WM, Thomas YF, Stinson FS, Grant BF. Prevalence, Correlates, Disability, and Comorbidity of DSM-IV Drug Abuse and Dependence in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of General Psychiatry*. 2007; 64:566–576. [PubMed: 17485608]
- Copeland W, Shanahan L, Costello EJ, Angold A. Cumulative prevalence of psychiatric disorders by young adulthood: a prospective cohort analysis from the Great Smoky Mountains Study. *Journal of the American Academy of Child & Adolescent Psychiatry*. 2011; 50:252–261. [PubMed: 21334565]
- Costello EJ, Erkanli A, Angold E. Is there an epidemic of child or adolescent depression? *Journal of Child Psychology and Psychiatry*. 2006; 47:1263–1271. [PubMed: 17176381]
- Côté J, Bynner JM. Changes in the transition to adulthood in the UK and Canada: The role of structure and agency in emerging adulthood. *Journal of Youth Studies*. 2008; 11:251–268.
- Dosenbach NUF, Nardos B, Cohen AL, Fair DA, Power JD, Church JA, Nelson SM, Wig GS, Vogel AC, Lessov-Schlaggar CN, Barnes KA, Dubis JW, Feczko E, Coalson RS, Pruett JR Jr, Barch DM, Petersen SE, Schlaggar BL. Prediction of individual brain maturity using fMRI. *Science*. 2010; 329:1358–1361. [PubMed: 20829489]
- Dunn V, Goodyer IM. Longitudinal investigation into childhood and adolescence-onset depression: Psychiatric outcome in early adulthood. *British Journal of Psychiatry*. 2006; 188:216–222. [PubMed: 16507961]
- Eaton WW, Shao H, Nestadt G, Lee BH, Bienvenu OJ, Zandi P. Population-based study of first onset and chronicity in major depressive disorder. *Archives of General Psychiatry*. 2008; 65:513–520. [PubMed: 18458203]
- Essau CA, Lewinsohn PM, Seeley JR, Sasagawa S. Gender differences in the developmental course of depression. *Journal of Affective Disorders*. 2010; 127:185–190. [PubMed: 20573404]
- Fergusson DM, Boden JM, Horwood LJ. Recurrence of major depression in adolescence and early adulthood, and later mental health, educational and economic outcomes. *British Journal of Psychiatry*. 2007; 191:335–342. [PubMed: 17906244]
- First, MB.; Spitzer, RL.; Gibbon, M.; Williams, JBW. User's guide for the Structured Clinical Interview DSM-IV Axis I Disorders – Clinician version (SCID-I). Washington, DC: American Psychiatric Press; 1997.
- Frank E, Prien RF, Jarrett RB, Keller MB, Kupfer D, Lavori PW, et al. Conceptualization and rationale for consensus definitions of terms in major depressive disorder: Remission, recovery, relapse, and recurrence. *Archives of General Psychiatry*. 1991; 48:851–855. [PubMed: 1929776]

- Garlow SJ, Rosenberg J, Moore JD, Haas AP, Koestner B, Hendin H, Nemeroff CB. Depression, desperation, and suicidal ideation in college students: results from the American Foundation for Suicide Prevention College Screening Project at Emory University. *Depression and Anxiety*. 2008; 25:482–488. [PubMed: 17559087]
- Goldston DB, Daniel SS, Erkanli A, Reboussin BA, Mayfield A, Frazier PH, Treadway SL. Psychiatric diagnoses as contemporaneous risk factors for suicide attempts among adolescents and young adults: Developmental changes. *Journal of Consulting and Clinical Psychology*. 2009; 77:281–290. [PubMed: 19309187]
- Hammen C, Brennan PA, Keenan-Miller D, Herr NR. Early onset recurrent subtype of adolescent depression: Clinical and psychosocial correlates. *Journal of Child Psychology and Psychiatry*. 2008; 49:433–440. [PubMed: 18221352]
- Hankin BL, Abramson LY, Moffitt TE, McGee R, Silva P, Angell KE. Development of depression from preadolescence to young adulthood: Emerging gender differences in a 10-year longitudinal study. *Journal of Abnormal Psychology*. 1998; 107:128–141. [PubMed: 9505045]
- Haro JM, Arbabzadeh-Bouches S, Brugha TS, De Girolamo G, Guyer ME, Jin R, Lepine JP, Mazzi F, Reneses B, Vilagut B, Sampson NA, Kessler RC. Concordance of the Composite International Diagnostic Interview Version 3.0 (CIDI 3.0) with standardized clinical assessments in the WHO World Mental Health Surveys. *International Journal of Methods in Psychiatric Research*. 2006; 15:167–180. [PubMed: 17266013]
- Harrington R, Fudge H, Rutter M, Pickles A, Hill J. Adult outcomes of childhood and adolescent depression: I. Psychiatric status. *Archives of General Psychiatry*. 1990; 47:465–473. [PubMed: 2184797]
- Harrington R, Rutter M, Weissman M, Fudge H, Groothues C, Bredenkamp D, Pickles A, Rende R, Wickramaratne P. Psychiatric disorders in the relatives of depressed probands I. Comparison of prepubertal, adolescent and early adult onset cases. *Journal of Affective Disorders*. 1997; 42:9–22. [PubMed: 9089054]
- Jaffee SR, Moffitt TE, Caspi A, Fombonne E, Poulton R, Martin J. Differences in early childhood risk factors for juvenile-onset and adult-onset depression. *Archives of General Psychiatry*. 2002; 59:215–222. [PubMed: 11879158]
- Kaufman J, Martin A, King RA, Charney D. Are child-, adolescent, and adult-onset depression one and the same disorder? *Biological Psychiatry*. 2001; 49:980–1001. [PubMed: 11430841]
- Keller MB, Boland RJ. Implications of failing to achieve successful longterm maintenance treatment of recurrent unipolar major depression. *Biological Psychiatry*. 1998; 44:348–360. [PubMed: 9755357]
- Keller MB, Lavori PW, Friedman B, Nielsen E, Endicott J, McDonald-Scott PA. Longitudinal Interval Follow-Up Evaluation (LIFE): A comprehensive method for assessing outcome in prospective longitudinal studies. *Archives of General Psychiatry*. 1987; 44:540–548. [PubMed: 3579500]
- Kessler RC, Berglund PA, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication (NCS-R). *Archives of General Psychiatry*. 2005; 62:593–602. [PubMed: 15939837]
- Kessler RC, Birmbaum H, Bromet E, Hwang I, Sampson N, Shahly V. Age differences in major depression: results from the National Comorbidity Survey Replication (NCS-R). *Psychological Medicine*. 2010; 40:225–237. [PubMed: 19531277]
- Kessler RC, Borges G, Walters EE. Prevalence of and risk factors for lifetime suicide attempts in the National Comorbidity Study. *Archives of General Psychiatry*. 1999; 56:617–626. [PubMed: 10401507]
- Kessler RC, McGonagle KA, Zhao S, Nelson CB, Hughes M, Eshleman S, Wittchen HU, Kendler KS. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States: Results from the National Comorbidity Study. *Archives of General Psychiatry*. 1994; 51:8–19. [PubMed: 8279933]
- Klein DN. Classification of depressive disorders in DSM-V: Proposal for a two-dimension system. *Journal of Abnormal Psychology*. 2008; 117:552–560. [PubMed: 18729608]

- Klein, DN.; Shankman, SA.; McFarland, B. Classification of mood disorders. In: Stein, DJ.; Kupfer, DJ.; Schatzberg, AF., editors. *The American Psychiatric Publishing Textbook of Mood Disorders*. Washington, DC: American Psychiatric Publishing, Inc; 2006. p. 17-32.
- Klein DN, Shankman SA, Lewinsohn PM, Seeley JR. Subthreshold depressive disorder in adolescents: Predictors of escalation to full syndrome depressive disorders. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2009; 48:703–710. [PubMed: 19465876]
- Kovacs M. Presentation and course of major depressive disorder during childhood and later years of the life span. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1996; 35:705–715. [PubMed: 8682751]
- Kovacs M. Gender and the course of major depressive disorder through adolescence in clinically referred youngsters. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2001; 40:1079–1085. [PubMed: 11556632]
- Kovacs M, Feinberg TL, Crouse-Novak MA, Paulauskas SL, Finkelstein R. Depressive disorders in childhood. I. A longitudinal prospective study of characteristics and recovery. *Archives of General Psychiatry*. 1984a; 41:229–237. [PubMed: 6367688]
- Kovacs M, Feinberg TL, Crouse-Novak M, Paulauskas SL, Pollock M, Finkelstein R. Depressive disorders in childhood. II. A longitudinal study of the risk for a subsequent major depression. *Archives of General Psychiatry*. 1984b; 41:643–649. [PubMed: 6732424]
- Kujawa AJ, Torpey D, Kim J, Hajcak G, Rose S, Gotlib IH, Klein DN. Attentional biases for emotional faces in young children of mothers with chronic or recurrent depression. *Journal of Abnormal Child Psychology*. 2011; 39:125–135. [PubMed: 20644991]
- Le HN, Muñoz RF, Ippen CG, Stoddard JL. Treatment is not enough: We must prevent major depression in women. *Prevention & Treatment*. 2003; 6 Article 10.
- Lewinsohn PM, Clarke GN, Seeley JR, Rohde P. Major depression in community adolescents: Age at onset, episode duration, and time to recurrence. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1994; 33:809–818. [PubMed: 7598758]
- Lewinsohn, PM.; Hoberman, HM.; Teri, L.; Hautzinger, M. An integrative theory of unipolar depression. In: Reiss, S.; Bootzin, RR., editors. *Theoretical issues in behavioral therapy*. New York: Academic Press; 1985. p. 313-359.
- Lewinsohn PM, Hops H, Roberts RE, Seeley JR, Andrews JA. Adolescent psychopathology: I. Prevalence and incidence of depression and other DSM-III—R disorders in high school students. *Journal of Abnormal Psychology*. 1993; 102:133–144. [PubMed: 8436689]
- Lewinsohn PM, Klein DN, Seeley JR. Bipolar disorder during adolescence and young adulthood in a community sample. *Bipolar Disorders*. 2000; 2:281–293. [PubMed: 11249806]
- Lewinsohn PM, Pettit JW, Joiner TE, Seeley JR. The symptomatic expression of major depressive disorder in adolescents and young adults. *Journal of Abnormal Psychology*. 2003; 112:244–252. [PubMed: 12784834]
- Lewinsohn PM, Roberts RE, Seeley JR, Rohde P, Gotlib IH, Hops H. Adolescent Psychopathology: II. Psychosocial risk factors for depression. *Journal of Abnormal Psychology*. 1994; 103:302–315. [PubMed: 8040500]
- Lewinsohn PM, Rohde P, Seeley JR, Baldwin CL. Gender differences in suicide attempts from adolescence to young adulthood. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2001; 40:427–434. [PubMed: 11314568]
- Lewinsohn PM, Rohde P, Klein DN, Seeley JR. Natural course of adolescent major depressive disorder: I. Continuity into young adulthood. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1999; 38:56–63. [PubMed: 9893417]
- Lewinsohn PM, Rohde P, Seeley JR. Psychosocial characteristics of adolescents with a history of suicide attempt. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1993; 32:60–68. [PubMed: 8428885]
- Lewinsohn PM, Rohde P, Seeley JR. Psychosocial risk factors for future adolescent suicide attempt. *Journal of Consulting and Clinical Psychology*. 1994; 62:297–305. [PubMed: 8201067]
- Lewinsohn PM, Rohde P, Seeley JR. Adolescent suicidal ideation and attempts: Prevalence, risk factors and clinical implications. *Clinical Psychology: Science and Practice*. 1996; 3:25–46.

- Lewinsohn PM, Rohde P, Seeley JR, Baldwin CL. Gender differences in suicide attempts from adolescence to young adulthood. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2001; 40:427–434. [PubMed: 11314568]
- Lewinsohn PM, Rohde P, Seeley JR, Hops H. Comorbidity of unipolar depression: I. Major depression with dysthymia. *Journal of Abnormal Psychology*. 1991; 100:205–213. [PubMed: 2040772]
- Lewinsohn PM, Rohde P, Seeley JR, Klein DN, Gotlib IH. Natural course of adolescent major depressive disorder in a community sample: Predictors of recurrence in young adults. *The American Journal of Psychiatry*. 2000; 157:1584–1591. [PubMed: 11007711]
- Lewinsohn PM, Rohde P, Seeley JR, Klein DN, Gotlib IH. Psychosocial functioning of young adults who have experienced and recovered from major depressive disorder during adolescence. *Journal of Abnormal Psychology*. 2003; 112:353–363. [PubMed: 12943014]
- Lewinsohn PM, Shankman SA, Gau JM, Klein DN. The prevalence and co-morbidity of subthreshold psychiatric conditions. *Psychological Medicine*. 2004; 34:613–622. [PubMed: 15099416]
- Lewinsohn PM, Solomon A, Seeley JR, Zeiss A. Clinical implications of “subthreshold” depressive symptoms. *Journal of Abnormal Psychology*. 2000; 109:345–351. [PubMed: 10895574]
- Lipsey, MW.; Wilson, DB. *Practical Meta-Analysis*. Thousand Oaks, CA: Sage Publications; 2001.
- McCaughey E, Myers K, Mitchell J, Calderon R, Schloredt K, Treder R. Depression in young people. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1993; 32:714–722. [PubMed: 8340290]
- Moffitt TE, Caspi A, Taylor A, Kokaua J, Milne BJ, Polanczyk G, Poulton R. How common are common mental disorders? Evidence that lifetime prevalence rates are doubled by prospective versus retrospective ascertainment. *Psychological Medicine*. 2010; 40:899–909. [PubMed: 19719899]
- Monroe SM, Harkness KL. Recurrence in major depression: A conceptual analysis. *Psychological Review*. 2011; 118:655–674. [PubMed: 21895384]
- Mueller TI, Leon AC, Keller MB, Solomon DA, Endicott J, Coryell W, et al. Recurrence after recovery from major depressive disorder during 15 years of observational follow-up. *American Journal of Psychiatry*. 1999; 156:1000–1006. [PubMed: 10401442]
- Olino TM, Shankman SA, Klein DN, Seeley JR, Pettit JW, Farmer RF, Lewinsohn PM. Lifetime rates of psychopathology in single versus multiple diagnostic assessments: Comparison in a community sample of probands and siblings. *Journal of Psychiatric Research*. in press.
- Orvaschel H, Puig-Antich J, Chambers WJ, Tabrizi MA, Johnson R. Retrospective assessment of prepubertal major depression with the Kiddie-SADS-E. *Journal of the American Academy of Child Psychiatry*. 1982; 21:392–397. [PubMed: 7119313]
- Nolen-Hoeksema S, Girgus JS. The emergence of gender differences in depression during adolescence. *Psychological Bulletin*. 1994; 115:424–443. [PubMed: 8016286]
- Pettit JW, Lewinsohn PM, Joiner TE. Propagation of major depressive disorder: Relationship between first episode symptoms and recurrence. *Psychiatry Research*. 2006; 141:271–278. [PubMed: 16497387]
- Pilkonis PA, Heape CL, Ruddy J, Serrao P. Validity in the diagnosis of personality disorders: The use of the LEAD standard. *Psychological Assessment*. 1991; 31:46–54.
- Rao U, Ryan ND, Birmaher B, et al. Unipolar depression in adolescents: Clinical outcome in adulthood. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1995; 34:566–578. [PubMed: 7775352]
- Rohde P, Lewinsohn PM, Klein DN, Seeley JR. Association of parental depression with psychiatric course from adolescence to young adulthood among formerly depressed individuals. *Journal of Abnormal Psychology*. 2005; 114:409–420. [PubMed: 16117578]
- Rohde P, Lewinsohn PM, Seeley JR. Comorbidity of unipolar depression: II. Comorbidity with other mental disorders in adolescents and adults. *Journal of Abnormal Psychology*. 1991; 100:214–222. [PubMed: 2040773]
- Rohde P, Lewinsohn PM, Seeley JR. Comparability of telephone and face-to-face interviews in assessing Axis I and II disorders. *American Journal of Psychiatry*. 1997; 154:1593–1598. [PubMed: 9356570]

- Rohde P, Lewinsohn PM, Seeley JR, Klein DN, Andrews JA, Small J. Psychosocial functioning of adults who experienced substance use disorders as adolescents. *Psychology of Addictive Behaviors*. 2007; 21:155–164. [PubMed: 17563135]
- Seeley JR, Kosty DB, Farmer RF, Lewinsohn PM. The modeling of internalizing disorders on the basis of patterns of lifetime comorbidity: Associations with psychosocial functioning and psychiatric disorders among first-degree relatives. *Journal of Abnormal Psychology*. 2011; 120:308–321. [PubMed: 21401216]
- Shanahan L, Copeland WE, Costello EJ, Angold A. Child-, adolescent- and young adult-onset depressions: differential risk factors in development? *Psychological Medicine*. 2011; 41:2265–2274. [PubMed: 21557889]
- Tamnes CK, Østby Y, Fjell AM, Westlye LT, Due-Tønnessen P, Walhovd KB. Brain maturation in adolescence and young adulthood: Regional age-related changes in cortical thickness and white matter volume and microstructure. *Cerebral Cortex*. 2010; 20:534–548. [PubMed: 19520764]
- Tanner JL, Reinherz HZ, Beardslee WR, Fitzmaurice GM, Leis JL, Berger SR. Change in prevalence of psychiatric disorders from ages 21 to 30 in a community sample. *Journal of Nervous and Mental Disease*. 2007; 195:298–306. [PubMed: 17435479]
- Uher R, Caspi A, Houts R, Sugden K, Williams B, Poulton R, Moffitt TE. Serotonin transporter gene moderates childhood maltreatment's effects on persistent but not single-episode depression: replications and implications for resolving inconsistent results. *Journal of Affective Disorders*. 2011; 135:56–65. [PubMed: 21439648]
- Van Noorden MS, Minkenberg SE, Giltay EJ, van der Wee NJ, Zitman FG. Pre-adult versus adult onset major depressive disorder in a naturalistic patient sample: The Leiden Routine Outcome Monitoring Study. *Psychological Medicine*. 2011; 41:1407–1417. [PubMed: 21078226]
- Weissman MM, Wolk S, Goldstein RB, et al. Depressed adolescents grown up. *Journal of the American Medical Association*. 1999; 281:1707–1713. [PubMed: 10328070]
- Williams DR, González HM, Neighbors H, Nesse R, Abelson JM, Sweetman J, Jackson JS. Prevalence and distribution of Major Depressive Disorder in African Americans, Caribbean Blacks, and Non-Hispanic Whites: Results from the National Survey of American Life. *Archives of General Psychiatry*. 2007; 64:305–315. [PubMed: 17339519]
- Wittchen HU, Nelson CB, Lachner G. Prevalence of mental disorders and psychosocial impairments in adolescents and young adults. *Psychological Medicine*. 1998; 28:109–126. [PubMed: 9483687]
- Witte TK, Fink E, Smith AR, Joiner TE. Do major depressive disorder and dysthymic disorder confer differential risk for suicide? *Journal of Affective Disorders*. 2009; 115:69–78. [PubMed: 18842304]
- Zisook S, Lesser I, Steward JW, Wisniewski SR, Balasubramani GK, Fava, et al. Effect of age at onset on the course of major depressive disorder. *American Journal of Psychiatry*. 2007; 164:1539–1546. [PubMed: 17898345]

Table 1
Rates of MDD First Incidence, Recurrence, and Total Incidence During the Four Developmental Periods

	Developmental Period											
	Child (5.0 - 12.9 Years)			Adolescent (13.0 - 17.9 Years)			Emerging Adult (18 - 23.9 Years)			Adult (24 - 30 Years)		
	N	%	95% CI	N	%	95% CI	N	%	95% CI	N	%	95% CI
First incidence	53	5	3.4 - 5.9	201	19	16.2 - 21.2	152	24	20.7 - 28.0	71	16	12.5 - 19.8
Recurrence	3	6	0.1 - 12.1	20	38	24.2 - 51.2	109	43	36.4 - 48.7	158	39	33.9 - 43.9
Total incidence	53	5	3.4 - 5.9	221	20	17.1 - 22.1	261	28	25.3 - 31.6	229	26	22.4 - 28.6

CI = confidence interval. Note. Percent and corresponding 95% confidence intervals are adjusted for weighting. N represents observed cases and do not account for weighting.

Table 2
Gender Predicting MDD First Incidence, Recurrence, and Total Incidence During the Four Developmental Periods

	Child (5.0 - 12.9 Years) OR; 95% CI	Adolescent (13.0 - 17.9 Years) OR; 95% CI	Emerging Adult (18 - 23.9 Years) OR; 95% CI	Adult (24 - 30 Years) OR; 95% CI
First incidence	4.03; 1.94 – 8.40 ***	2.54; 1.77 – 3.64 ***	2.50; 1.65 – 3.77 ***	2.49; 1.41 – 4.38 **
Recurrence	0.38; 0.03 – 5.14	6.08; 0.65 – 56.85	1.25; 0.70 – 2.26	1.31; 0.82 – 2.12
Total incidence	4.03; 1.94 – 8.40 ***	2.72; 1.92 – 3.86 ***	2.38; 1.70 – 3.33 ***	2.31; 1.63 – 3.30 ***

OR = odds ratio; CI = confidence interval. *Note.* 95% confidence intervals adjusted for weighting.

** $p < .01$,

*** $p < .001$.

Table 3
Period Comorbidity of MDD with Anxiety and Substance Use Disorders During the Four Developmental Periods

Disorder	Developmental Period							
	Child (5 - 12.9 Years)		Adolescent (13 - 17.9 Years)		Emerging Adult (18 - 23.9 Years)		Adult (24 - 30 Years)	
	% given MDD vs. no MDD	OR; 95% CI	% given MDD vs. no MDD	OR; 95% CI	% given MDD vs. no MDD	OR; 95% CI	% given MDD vs. no MDD	OR; 95% CI
Anxiety	26 vs. 6	5.1; 2.6 - 10.1	15 vs. 4	4.3; 2.6 - 7.1	11 vs. 3	3.5; 2.0-6.3	18 vs. 4	4.7; 2.8-8.1
Substance use ^a	9 vs. 1	9.3; 3.1 - 28.2	31 vs. 19	2.0; 1.4 - 2.8	39 vs. 24	2.0; 1.4-2.8	31 vs. 16	2.4; 1.7-3.5
Substance use ^b	11 vs. 1	8.2; 2.4 - 28.6	28 vs. 17	1.9; 1.3 - 2.6	38 vs. 24	2.0; 1.4 - 2.8	30 vs. 15	2.4; 1.6 - 3.4

OR = odds ratio; CI = confidence interval. All tests significant at $p < .001$.

^a = unadjusted associations;

^b = adjusted for the lifetime presence of disruptive behavior disorders.

Table 4
Number and Duration of MDD Episodes and Rates of Suicide Attempt Given MDD During the Four Developmental Periods

	Child (5 - 12.9 Years)	Adolescent (13 - 17.9 Years)	Emerging Adult (18 - 23.9 Years)	Adult (24 - 30 Years)
Number of MDD episodes	57	272	336	326
MDD Episode Duration				
Mean duration (weeks)	69.0	24.4	23.8	28.1
95% CI	40.7 - 97.4	15.7 - 33.0	19.1 - 28.5	22.9 - 33.4
Standard Error	14.2	4.4	2.4	2.6
Median	16.0	8.0	12.0	12.0
Range	2 - 520	2 - 829	2 - 426	2 - 452
Rates of Suicide Attempt Given MDD				
%	10	19	8	5
95% CI	1.5 - 17.3	14.4 - 22.9	4.5 - 10.5	2.3 - 7.4
% females	11	20	7	5
95% CI	2.0 - 20.8	15.3 - 25.4	3.3 - 10.2	1.7 - 7.3
% males	0	14	9	6
95% CI	NA	6.2 - 21.1	3.4 - 15.4	0.1 - 11.7

MDD = major depressive disorder, CI = Confidence interval.