The Changing Rate of Major Depression

Cross-National Comparisons

Cross-National Collaborative Group

Objective.—To estimate temporal trends in the rates of major depression cross-nationally.

Design.—Nine epidemiologic surveys and three family studies.

Setting and Participants.—Approximately 39 000 subjects in population-based samples from nine epidemiologic surveys, and 4000 relatives from three family studies that were conducted independently but using similar methodology in the 1980s in North America, Puerto Rico, Western Europe, the Middle East, Asia, and the Pacific Rim.

Outcome Measures.—Age at first onset of major depression by birth cohort and time period.

Results.—There was an increase in the cumulative lifetime rates of major depression with each successively younger birth cohort at all sites with the exception of the Hispanic samples, in whom the rates in the older cohort (1915 through 1935) were approximately equal to those of the younger cohorts. However, results of fitting statistical models that separate period and cohort effects showed an overall increase in the rates of major depression over time over all countries, although the magnitude of the increase varied by country. The average relative risk of major depression between a particular cohort and the cohort born immediately before varied between 2.6 (95% confidence interval, 1.8 to 3.7) in Florence, Italy, and 1.3 (95% confidence interval, 1.2 to 1.4) in Christchurch, New Zealand. Short-term fluctuations in the rates of major depression during specific time periods and in specific cohorts also varied by country.

Conclusions.—Cross-nationally, the more recent birth cohorts are at increased risk for major depression. There are, however, variations in the long- and short-term trends for major depression by country, which suggests that the rates in these countries may have been affected by differing historical, social, economic, or biological environmental events. The linking of demographic, epidemiologic, economic, and social indices by country to these changes may clarify environmental conditions that influence the rates of major depression.

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MAJOR depression is a psychiatric disorder[1] associated with considerable impairment in functioning comparable to, and at times worse than, that for patients with a number of chronic medical conditions.[2] Although depression was once believed to be a disorder of the middle-aged and elderly, increasing numbers of depressed patients, particularly adolescents and young adults, are being seen in clinical practice in the United States.

From the Cross-National Collaborative Group.

A complete list of the participants in this research study appears at the end of this article.

Reprint requests to Department of Psychiatry, College of Physicians and Surgeons of Columbia University, 722 W 168th St, Unit 14, New York, NY 10032 (Dr Myrna M. Weissman).

Recent studies in the United States that included both treated and untreated persons[3-6] suggest that the clinical trends represent a real change in rates of major depression, not just an artifact of increased help seeking. These studies have found an overall increase in the rates of major depression in the cohorts born since World War II, a persistently higher rate of major depression in females than in males, and evidence for a period effect with an increase in rates between 1960 and 1980.

In a previous publication in *JAMA*, Klerman and Weissman[7] reviewed the published data from community and family studies as well as the evidence for artifacts of retrospective recall, mortality, and labeling that could explain these trends, and concluded that the findings could not be fully explained as an artifact. The reader is referred to that study for a full discussion. Since its publication, new data on a 6-year prospective study of 965 subjects from a nonclinical sample who had no psychiatric illness when first examined found a threefold increase in the rate of first-onset major depression in the most recent birth cohort (<40 years of age) as compared with older birth cohorts.[8] These prospective findings were interpreted as direct evidence for a birth cohort effect.

The Klerman and Weissman review of published cross-national data[7] suggested the presence of birth cohort trends in depression in some but not all countries. However, published data are only partially satisfactory, since diagnostic criteria, time periods, and statistical approaches vary and accurate estimates of temporal changes cannot be made. It is possible to determine directly if these observations are consistent internationally because data from large-scale epidemiologic and family studies using similar diagnostic approaches are available for the first time. Following the 1989 *JAMA* article, a cross-national collaboration was developed with most of these investigators. This is a report of the first results of these analyses.

We present results of a direct analysis of temporal trends for major depression from nine epidemiologic community and three family studies conducted independently in the 1980s in North America, Western Europe, the Middle East, Asia, and the Pacific Rim. Similar diagnostic procedures and criteria and a common data analytic plan were used so that methodological differences were minimized. The purpose is to determine the variation in the rates of major depression over time across countries with different historical, social, and biological environmental experiences as a first step in understanding environmental conditions that may influence the rates of the disorder.

DEFINITION OF TEMPORAL TRENDS

Temporal trends are variations in rates over time and can be age, period, or cohort trends. Age trends refer to

Table 1.—Characteristics of Community and Family Studies

Site	Year(s) Conducted	Sample Size	% Female	Ethnic Group	Age Range, y
		Community Studies			
ECA (Epidemiologic Catchment Area Study) (5 US sites)[11]	1980-1984	18244	59	70% White	≥18
Edmonton, Alberta[15,16]	1983-1986	3258	59	White	≥18
Puerto Rico[17,18]	1984	1551	56	Puerto Rican	17-64
Munich, Germany[19-23]	1974, 1981	480	52	White	25-64
Florence, Italy[24]	1984	1000	53	White	≥15
Paris, France[25,26]	1987-1988	1716	62	White	18-85
Beirut, Lebanon[27,28]	1988-1989	521	56	White	≥18
Christchurch, New Zealand[29]	1986	1419	66	White	18-64
Taiwan[30-32]	1982-1984	10880	48	Chinese	≥18
		Family Studies			
NIMH (National Institute of Mental Health) Collaborative Study (5 university centers)[33]	1978-1982	2236	54	White	≥18
Yale Family Study[34]	1977-1980	810	51	White	≥18
Mainz Family Study[35]	1987-1989	1153	51	White	≥17

changes in age-specific rates of illness, usually the age at first onset of the disorder. Hypertension and most cancers have strong age effects. Period trends refer to changes in the rates of illness associated with a demarcated time period, best illustrated by epidemics of infectious diseases and by the decrease of alcoholic dementia during Prohibition. Cohort trends refer to changes in rates of illness among individuals who are defined by some shared, continued temporal experience, usually the year or decade of their birth. See reference 7 for a discussion.

METHODS

Participating investigators at each site were provided with a common data plan, definitions, and computer programs. The investigators then determined cumulative rates of major depression, based on either Research Diagnostic Criteria (RDC) or *DSM-III* criteria[1,9] by defined birth cohort, sex, and age of onset. Respondents were considered to meet diagnostic criteria for major depression if they reported at least one depressive episode as defined in the *DSM-III* or RDC without ever meeting the criteria for a manic episode. The criteria for major depression are sufficiently similar for the *DSM-III* and RDC to allow comparison across studies.[7] Translations of the instruments were made by the investigators in each country as appropriate, and the information on translation is included in the references.

Table 1 describes year of study, sample size, and demographic characteristics for each study. The number of subjects for each site may differ slightly from previously published reports, since only subjects who had valid data for age at interview, diagnosis of major depression, and age of onset were included in these analyses. Prevalence rates, sex and age distributions, and other socioeconomic characteristics of major depression are included in the references for each site.

Data from the nine community studies were from household probability samples of adults drawn from a defined population area and used the Diagnostic Interview Schedule, a highly structured interview, developed and widely used in epidemiologic research,[10] that yields *DSM-III* psychiatric diagnoses.[1] The data from the Epidemiologic Catchment Area Study (ECA)[11] derive from five US communities (New Haven, Conn; Baltimore, Md; St Louis, Mo; Piedmont County, North Carolina; and Los Angeles [LA], Calif). Included in the LA site of the ECA[12-14] was a Hispanic sample (N=1305), 93% of whom were Mexican Americans. The Canada study[15,16] was restricted to the city of Edmonton, Alberta. The Puerto Rico study[17,18] included persons living in households throughout Puerto Rico, in addition to household members temporarily away and those in institutions. The Munich, Germany, Follow-up Study[19-23] was a 7-year follow-up investigation of a stratified random general population sample drawn from Munich in 1974. The stratification method used for the phase II 1981 follow-up included all subjects who had high scores on the clinical self-rating scales at the phase I investigation in 1974, plus 39.8% of the sample who were randomly drawn from the subjects successfully interviewed in phase I. The Florence, Italy, study[24] included persons randomly selected from lists registered with seven general medical practitioners from an upper-class residential area, a lower-middle-class ward, or a mixed residential and working class suburb. A structured interview administered by a physician, including questions derived from the *DSM-III* flow chart for the affective disorders, was used. The French survey[25,26] was conducted in Savigny, a newly built city located near Paris. The Beirut, Lebanon, study[27,28] was conducted to determine the relationship between war events and depression. Two communities in Beirut and two communities outside of Beirut proper (Hornet Shehwan and Bejjeh) with differential exposure to acts of war were studied. The New Zealand study[29] included adults living in Christchurch, New Zealand. The sampling design oversampled young females; weighting compensated for this. Only data for whites (95% of the sample) are reported herein. The Taiwan study[30-32] sampled three population areas representing metropolitan, township, and rural areas.

Data from the three family studies derive from first-degree relatives of probands with major depression and/or other affective disorders and used RDC.[9] The NIMH (National Institute of Mental Health) Collaborative Study on the Psychobiology of Depression[33] included patients who sought treatment for affective disorders at one of five US university medical centers (in Boston, Mass; Chicago, Ill; Iowa City, Iowa; New York, NY; or St Louis, Mo). Like the NIMH study above, the Yale Family Study[34] included adult first-degree relatives of patients with major depression. The Mainz, Germany, Family Study,[35] similar in design to the family studies above, included first-degree relatives of patients with major depression or other affective disorders. The relatives in these three family studies were directly interviewed with the Schedule for Affective Disorders and Schizophrenia (SADS-L).[36] In addition to direct interview, at Yale and Mainz family history methods were used. Best estimate diagnoses of probands and relatives, based on all available information, were made blind to the clinical status of the proband by a psychiatrist and a second diagnostician. Discrepancies were reviewed on a case-by-case basis.[37]

STATISTICAL METHODS

Seven birth cohorts were defined, following previous analyses: earlier than 1905, 1905 through 1914, 1915 through 1924, 1925 through 1934, 1935 through 1944, 1945 through 1954, and 1955 or later.[5] Age of onset in years for major depression was divided into 10-year intervals beginning at the age of 5 years up to 74 years. The period of onset is defined by the age of onset and the birth cohort of the individual; thus, period intervals are overlapping 20-year intervals. If an individual who reported a

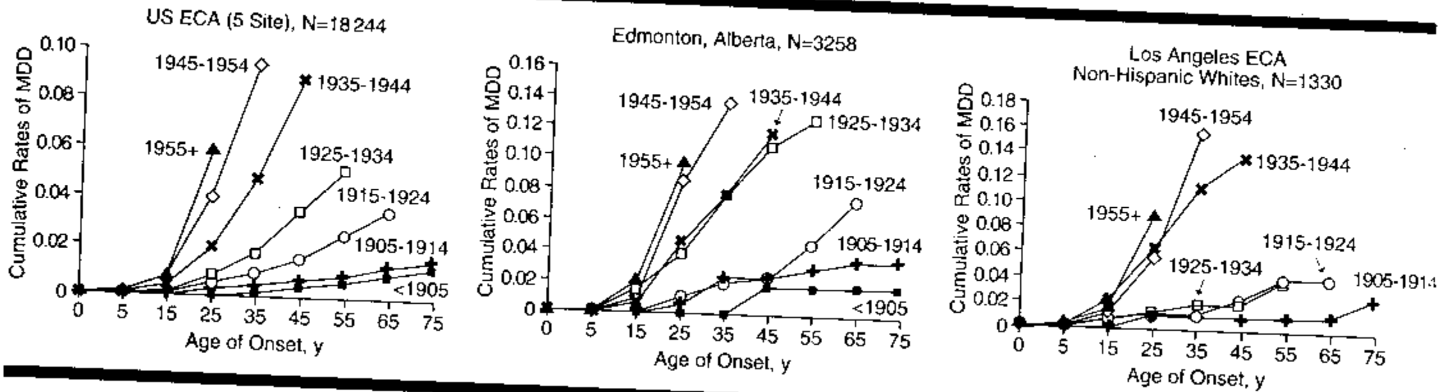

Fig 1.—Cumulative lifetime rates of major depression by birth cohort and age of onset—North America. MDD indicates major depressive disorder; and ECA, Epidemiologic Catchment Area Study.

first onset between the years 5 and 14 was born between 1905 and 1914, the period of onset would be the time interval 1910 through 1929. For individuals belonging to this same birth cohort who reported a first onset between the years 15 and 24, the corresponding period of onset would be the interval 1920 through 1939, which overlaps the previous period. Data were analyzed using actuarial life table methods[38,39] to determine the cumulative rates of depression through each age of onset interval per cohort. The time at risk for major depression, or the survival time, was either the age of onset of the first major depressive episode or, for those who had not met criteria for major depression, the age at the time of interview. The Kaplan-Meier product limit estimate[40] was used to estimate the cumulative lifetime prevalence of major depression for each cohort.

The piecewise constant hazards model introduced by Holford for life table analysis was used to assess the simultaneous effects of age, period, and cohort.[41-44] The model assumes that the survival time of an individual can be partitioned into a given number of mutually exclusive and exhaustive intervals such that the underlying hazard function is a constant within each interval. This assumption implies that the survival times have a piecewise exponential distribution. Using this model, the log of the age-specific incidence rate may be expressed as a linear function of age, period, and cohort effects:

$$\log (r_{ijk}) = m + a_i + p_j + c_k + e_{ijk}$$

where r_{ijk} is the rate for a given age, period, and cohort; m is an intercept; a_i, p_j, and c_k are the main effects for age, period, and cohort, respectively; and the term e_{ijk} represents random error. Maximum likelihood estimates of these parameters can be obtained.[45] The "goodness of fit" of a particular model is assessed by the likelihood ratio χ^2 statistic.

Models were fitted that partitioned the cohort and period parameters into linear and nonlinear components.[46] The analyses focused on the cohort and period parameters, although age parameters were also included in the model, because patterns of birth cohort and period effects are particularly sensitive indicators of the changing environment, and could provide valuable clues to factors affecting onsets of the disorder.

The identification problem in age-period-cohort models is due to the fact that unique estimates cannot be defined for the linear age, period, and cohort components. However, the sum of the linear cohort and linear period effects is uniquely estimable. We have used the approach discussed by Clayton and Schifflers[47,48] to surmount the identification problem. As they have pointed out, the sum of the linear period and linear cohort components represents a measure of the regular temporal variation of rates, which does not distinguish between period and cohort influences, and they have introduced the term "drift" to describe such variation. The drift parameter is a coefficient that reflects the long-term forces acting in these analyses on rates of major depression over time. Alternatively, the short-term fluctuations are measured by the nonlinear cohort and nonlinear period effects, which may be interpreted as deviations from the regular trend due to specific cohorts or periods. The advantage of partitioning the components in this way is that both the drift parameters and the nonlinear cohort and nonlinear period effects (referred to henceforth as cohort and period effects, respectively) can be estimated without the additional constraints needed to identify parameters in other versions of the age-period-cohort models.

The analytic strategy used first was to fit models containing age, gender, drift, and nonlinear cohort and period terms to each individual site separately. These models estimate the long-term variation for the sites as well as the short-term fluctuations. Next, models were fitted to the data for all sites combined. These models contained, in addition to the age, gender, drift, and nonlinear cohort and nonlinear period terms, a term for site and terms for the interaction between site and drift, the interaction between site and nonlinear cohort parameters, and the interaction between site and nonlinear period parameters. Comparison of various hierarchical models that included subsets of these interactions with site provided a formal test of whether the pattern of variation of these rates over time was significantly different across sites. Cohorts born before 1915 were excluded because of small sample size.

RESULTS

Cumulative Rates of Major Depression by Birth Cohort

The North American sites (Fig 1) show an increase in the cumulative rates of major depression with each successively younger birth cohort. There is an increase in rates by 25 years of age starting with the cohort born between 1935 and 1944 for the ECA and the LA white subsample. This increase is especially evident at the LA site. Edmonton shows an increase in rates by the age of 25 years starting with the cohort born between 1925 and 1934, a decade earlier than the United States.

The pattern of the cumulative rates of major depression by birth cohort differs in the Hispanic samples (Fig 2) from the pattern in the United States. For Hispanics, the cumulative lifetime rates of major depression among the older birth cohorts are approximately equal to the rates for the younger birth cohorts, in contrast to the other non-Hispanic North American sites where the cumulative rates for older cohorts are considerably lower than those for younger cohorts.

Cumulative rates by cohort for Europe and the Middle East are shown in Fig 3. The Munich sample lacks cohorts born after 1944. The cohorts born between 1925 and 1934 and between 1935 and 1944 are indistinguishable. Rates in both are greater than in older cohorts, beginning at the age of 25 years. In Florence, the youngest cohort (1945 through 1954) has an increase in rates beginning by age 15. For the Parisian sample, the cumulative prevalence by the age of 25 years in the youngest cohort (1955+) is already higher than the prevalence by the age of 55 years in the older cohorts (born before 1925). The Beirut sample shows that the cumulative rates of onset are highest for the cohort born in 1955 or later, who were 20 years of age or younger when the Lebanon wars began in 1975.

Christchurch (Fig 4) shows an increase in the rates of major depression by the age of 25 years starting with the cohort born between 1945 and 1954, a decade later than the United States. The rates continue to rise in the youngest birth cohort (1965+), also. Taiwan (Fig 4) shows that by age 35, those born after 1925 show an increase compared with earlier cohorts. These results may be unstable because of the overall low lifetime prevalence for major depression in Taiwan.

The overall rates of major depression are higher in the family studies than in community studies because of the well-documented familial aggregation of major depression in biological relatives (Fig 5). Nevertheless, the three family studies also show similar patterns of higher rates in the younger cohorts. In the NIMH study, lifetime rates accelerate for each successive cohort. The patterns for the Yale study are similar to those for the NIMH study, although the cumulative rates are lower. The Mainz study shows an increase in cumulative rates by 25 years of age starting with the cohort born between 1935 and 1944.

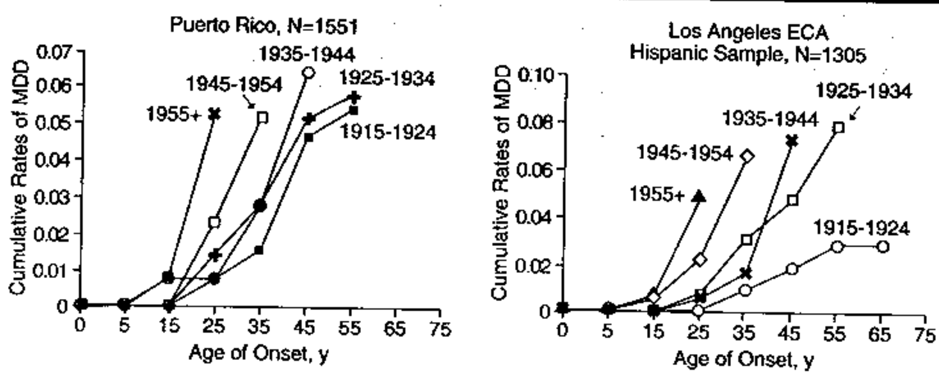

Fig 2.—Cumulative lifetime rates of major depression by birth cohort and age of onset—Hispanic samples. MDD indicates major depressive disorder; and ECA, Epidemiologic Catchment Area Study.

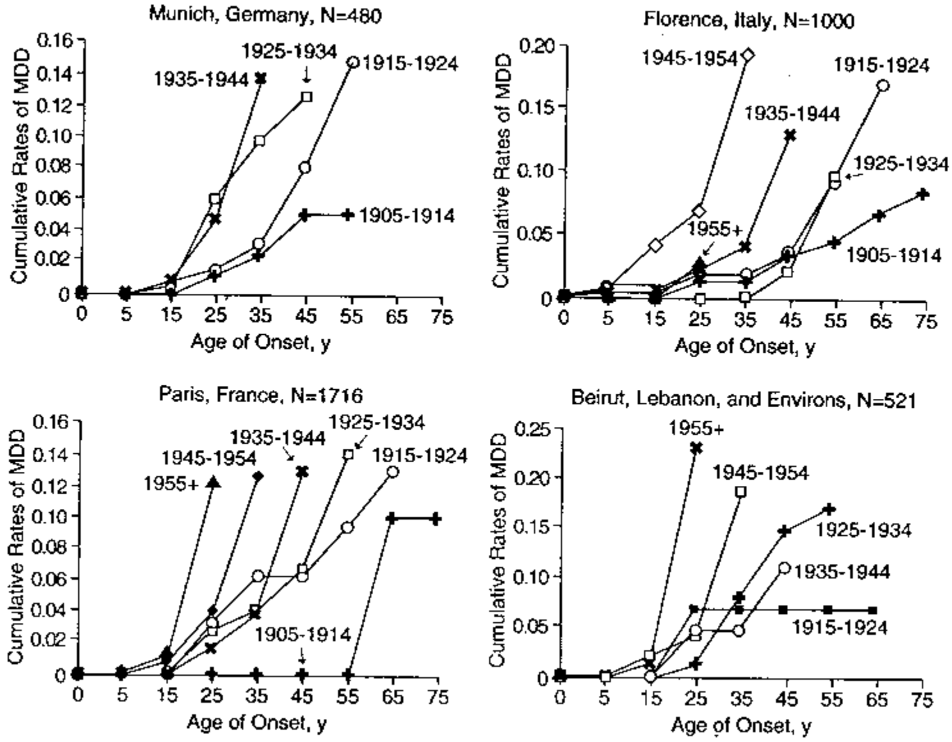

Fig 3.—Cumulative lifetime rates of major depression by birth cohort and age of onset—Western Europe and the Middle East. MDD indicates major depressive disorder.

Modeling Age-Period-Cohort Effects

In modeling the age-period-cohort effects, the drift parameter[47,48] is a coefficient that reflects the long-term forces acting on rates of major depression over time. Alternatively, the short-term fluctuations are measured by the nonlinear cohort and nonlinear period effects, which may be interpreted as deviations from the regular trend due to specific cohorts or periods. Table 2 shows the drift parameter, its standard error, antilog, and the 95% confidence interval. The drift parameter is positive for each site, implying an increase in the rates of major depression over time for all sites. Estimates of the drift parameter varied between 0.26 for Christchurch and 0.94 for Florence. It is assumed that the secular trend is entirely due to the effect of birth cohort rather than to the period. These parameters may be interpreted as the logarithm of the average relative risk of developing depression between any two adjacent cohorts. Results can be interpreted as showing that the average relative risk of major depression between a particular cohort and the cohort born immediately before ranges between 2.6 in Florence and 1.3 in Christchurch (the antilogs of 0.94 and 0.26, respectively).

To examine whether the drift parameters differed significantly by site, the model containing the main effects of age, gender, site, and drift and a site*drift interaction term was initially fitted. A second model was fitted that contained all the above parameters except for the site*drift interaction term. Comparison of these two models reveals that the drift parameter varies significantly with site ($P<.005$), implying that the magnitude of the long-term variation with time differs by site.

To evaluate whether there are important site-specific period or cohort effects, a model was fitted containing the main effects of age, gender, site, drift, nonlinear cohort, and nonlinear period and the interaction terms of site with drift, nonlinear cohort, and nonlinear period. Goodness-of-fit statistics showed that this model produces an adequate fit to the data ($P=.46$). Next, models were fitted that excluded the site*cohort interaction term and the site*period interaction term, respectively. A comparison of these three models showed that both nonlinear cohort and nonlinear period effects vary significantly with site ($P<.005$ and $P<.001$, respectively), which is to be expected if it is hypothesized that the short-term fluctuations are due to influences that are specific to these sites.

There was considerable variation of fitting age-period-cohort models to the data from each site. The models that best fit the data for five US sites, LA whites, Beirut, and Taiwan contain both nonlinear cohort and nonlinear period effects, while the best-fitting model for Paris contains only a significant nonlinear period effect. The best-fitting model for Florence contains only a significant nonlinear cohort effect. Although there is an overall long-term increasing trend in rates over time as determined by the drift parameter, the short-term fluctuation with cohort and period also varies considerably with site.

Figures 6 and 7 plot the short-term cohort and short-term period fluctuations for sites where these trends are significant. In terms of specific patterns, comparison of cohort effects (Fig 6) showed that in the five US ECA sites, LA whites, and Florence, there was an increase in rates of depression in the cohort born between 1935 and 1944. The rates continued to rise in the cohort born between 1945 and 1954 and then drop for the cohort born in 1955 or later for the ECA and Florence, but started to drop from 1945 onward in LA whites. In Taiwan, the rates decreased between the cohorts born from 1915 to 1924 and from 1935 to 1944 and then started to increase. In Beirut, there were dramatic fluctuations with each successive cohort. The rates increased in the cohort born from 1925 to 1934, decreased in the cohort born from 1935 to 1944, increased again in the cohort born from 1945 to 1954, and decreased slightly once more in the cohort born in 1955 or later.

For those sites exhibiting period effects (Fig 7), the patterns varied widely. In the ECA, the rates decreased between 1930 and 1950, remained stable between 1950 and 1970, and then started to increase from 1960 to 1980. Los Angeles whites show that the period effect decreases between 1930 and 1950, and then begins and continues to rise between 1950 and 1980. The period effect in Paris shows the rates decreasing between 1940 and 1960, then increasing between 1960 and 1970, and continuing to increase between 1970 and 1980. Period effects from Taiwan show that there was a sharp decrease in rates between 1930 and 1940, with the rates continuing to decrease slightly between 1940 and 1950, increasing dramatically between 1950 and 1970, then decreasing again between 1970 and 1980. At Beirut, there were dramatic variations in rates of major depression between successive periods. The rates dropped sharply between 1940 and 1950; increased sharply between 1950 and 1960; dropped again, although less sharply, between 1960 and 1970; and increased again between 1970 and 1980.

COMMENT

This is the first time that temporal trends for major depression have been directly analyzed across international sites. The results showed an overall trend for increasing rates of major depression over time for all sites; the magnitude of this increase varied considerably with site. In addition, there were short-term fluctuations due to period and/or cohort effects, which also varied considerably across sites, possibly due to specific events occurring within sites. The increase in rates of major depression occurs in highly loaded families as well as in community samples, suggesting that the increases were not just sporadic cases.

For the five-site US ECA, LA whites, Taiwan, and Beirut, there were significant short-term fluctuations in rates at different periods *and* by cohort. The short-term fluctuations of both period and cohort effects were not as strong for the five-site ECA as they were in the other studies, where significant short-term fluctuations were detected. At Florence, there were short-term fluctuations by cohort, while at Paris, short-term fluctuations were found in different periods.

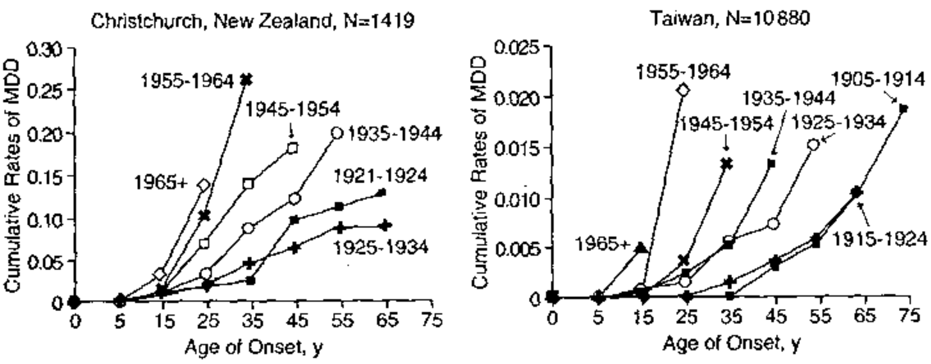

Fig 4.—Cumulative lifetime rates of major depression by birth cohort and age of onset—Asia and the Pacific Rim. MDD indicates major depressive disorder.

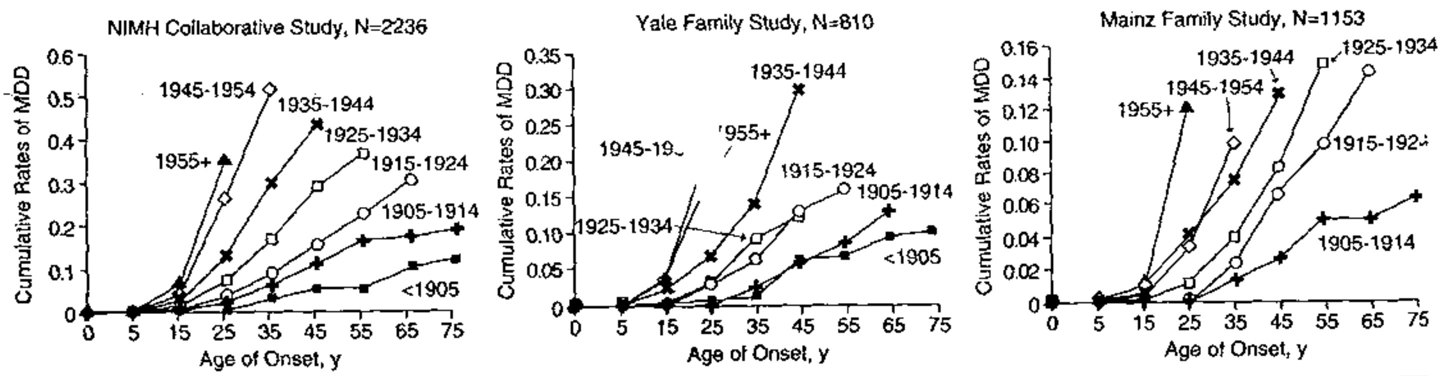

Fig 5.—Cumulative lifetime rates of major depression by birth cohort and age of onset—family studies. MDD indicates major depressive disorder; and NIMH, National Institute of Mental Health.

In contrast, short-term fluctuations due to either period or cohort effects were *not* statistically significant in Edmonton, Munich, Christchurch, LA Hispanics, Puerto Rico, and in all three of the family studies. At these sites, the rates of major depression increased gradually over time with each cohort and/or each period. There was little evidence for sudden changes in rates during any specific period or any specific cohort. None of the family studies exhibited any short-term fluctuation due to period or cohort effects. These results suggest that the increase in rates in the family studies is gradual and less likely to be due to the occurrence of specific events. The lack of a nonlinear cohort or period effect in the family studies might be due to the familiality of depression in relatives, which might imply less susceptibility to time-related specific events, or due to the application in all three family studies of the SADS-L interview, which has not been used in any of the community samples under study.

Table 2.—Estimate of "Drift" Parameters by Site From Best-Fitting Age-Period-Cohort Model

Site	Estimate of Drift Parameter (SE)	Average Relative Risk (Antilog) (95% Confidence Interval)
North America		
5 US sites	0.62* (0.07)	1.9 (1.6-2.1)
Los Angeles whites	0.47* (0.09)	1.6 (1.3-1.9)
Edmonton	0.41* (0.06)	1.5 (1.3-1.7)
Western Europe and Middle East		
Florence	0.94* (0.19)	2.6 (1.8-3.7)
Paris	0.37* (0.18)	1.5 (1.0-2.1)
Beirut	0.56* (0.21)	1.7 (1.2-2.6)
Munich	0.51* (0.23)	1.7 (1.1-2.6)
Asia and Pacific Rim		
Taiwan	0.50* (0.16)	1.6 (1.2-2.6)
Christchurch	0.26* (0.04)	1.3 (1.2-1.4)
Hispanic		
Los Angeles Hispanics	0.72* (0.18)	2.0 (1.4-2.9)
San Juan	0.47* (0.13)	1.6 (1.2-2.1)
Family studies		
National Institute of Mental Health (US)	0.60* (0.04)	1.8 (1.7-2.0)
Mainz (Germany)	0.53* (0.11)	1.7 (1.4-2.1)
Yale (US)	0.45* (0.10)	1.6 (1.3-1.9)

*$P<.05$; estimate of drift parameter is significantly different from zero.

It is unlikely that the existence of statistically significant period and cohort effects in some but not all sites is entirely a function of statistical power to detect these effects. For example, neither Edmonton nor the NIMH family studies exhibit nonlinear cohort or period effects, although they have the third and fourth largest sample sizes among these studies, and consequently would be expected to have more power to detect these effects than many of the other sites. This interpretation of the absence of a nonlinear cohort or nonlinear period effect is at variance with the period effect between the 1960s and 1970s previously reported by the investigators in the NIMH Collaborative Depression Study Family Studies.[49-51] This difference in conclusions may be the result of different statistical techniques, but further investigation is required to reconcile the differences in conclusions and interpretation.

The variation in short-term trends across sites using similar methods suggests that these trends cannot be solely due to artifacts. If the increasing cohort effect with each successive generation were solely an artifact of reporting or forgetting over time, one would not expect to find variability in short-term fluc-

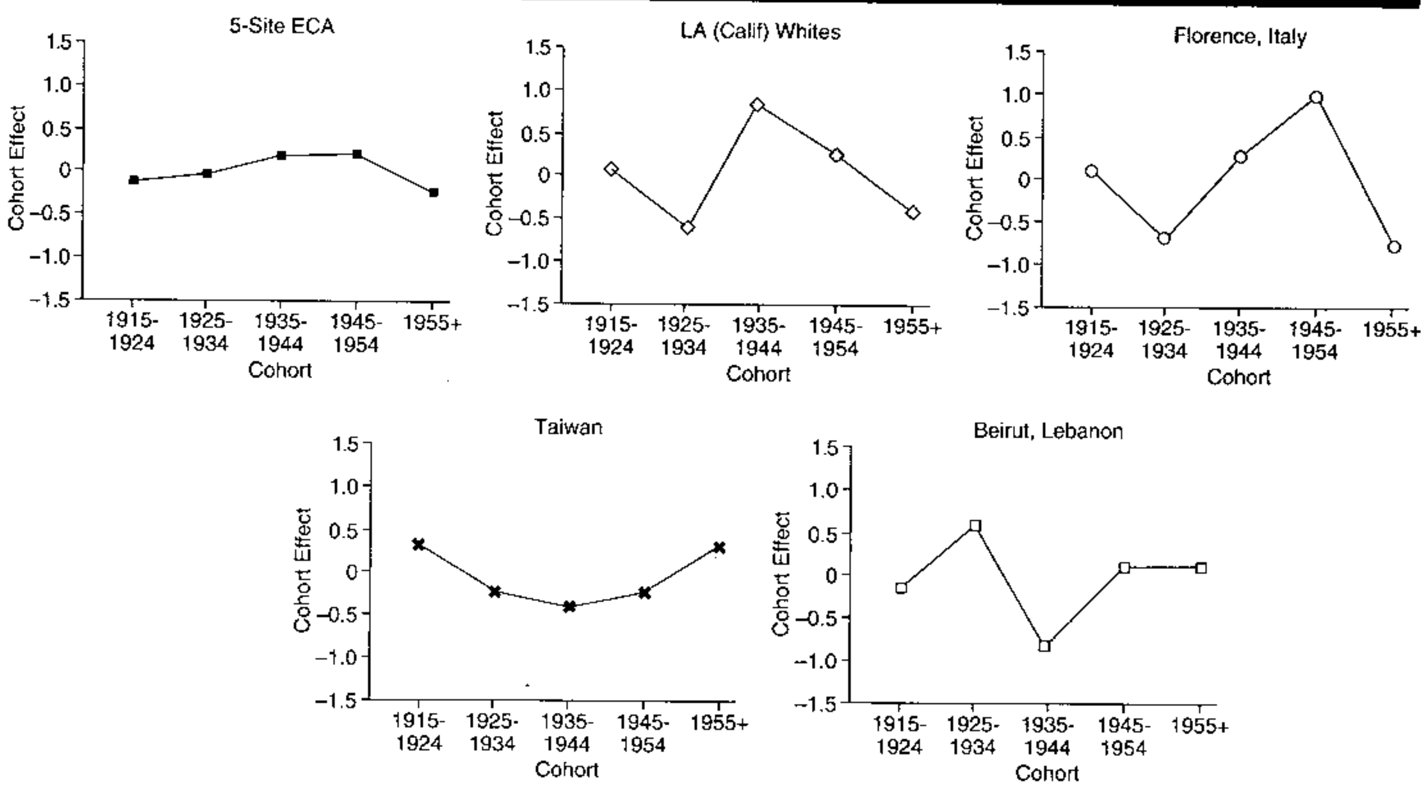

Fig 6.—Significant short-term cohort fluctuations. ECA indicates Epidemiologic Catchment Area Study; and LA, Los Angeles.

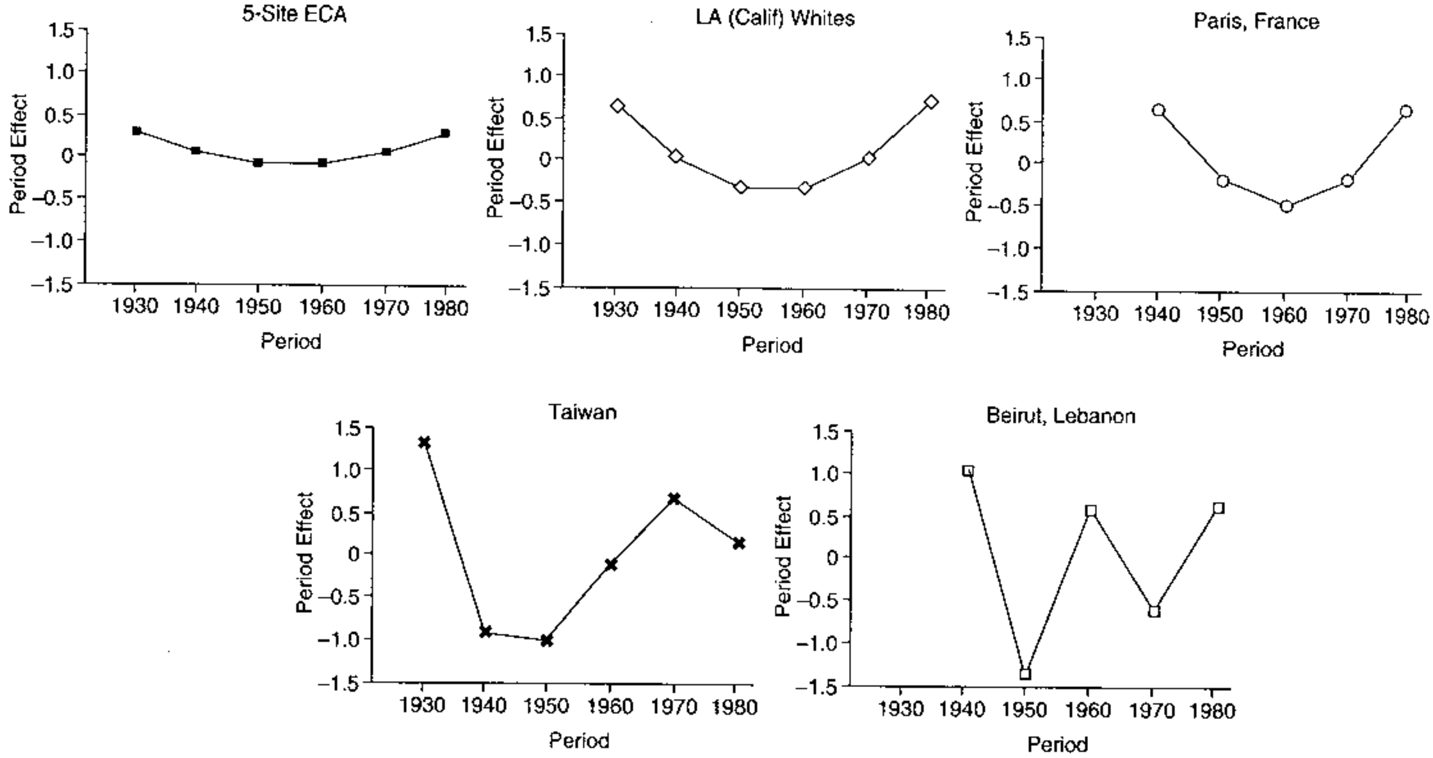

Fig 7.—Significant short-term period fluctuations. ECA indicates Epidemiologic Catchment Area Study; and LA, Los Angeles.

tuations, and the changes in rates would also be of the same magnitude across sites.

It now remains to identify these potential risk factors that could account for the overall trend for increasing rates over all sites, as well as those site-specific events that could account for the cohort and period fluctuations. In terms of site-specific events in Beirut, for example, there was a dramatic increase in the short-term period effect (Fig 7) from 1950 to 1960, a period of chaotic political and demographic change in the area. The period effect decreased between 1960 and 1970, when there was relative social and economic prosperity and stability in the country, increasing again between 1970 and 1980, reflecting change in the rate of depression during the period of the latest Lebanese wars. The short-term cohort effect for Beirut (Fig 6) shows that there was a variation in the effect for cohorts that came of age during the periods mentioned above: an increase in the effect for the cohort born between 1925 and 1934, who came of age from 1950 to 1960; a decrease for the cohort born between 1935 and 1944, who came of age from 1960 to 1970; and an increase for the cohort born between 1945 and 1954, who came of age from 1970 to 1980.

This type of interpretation can only be conjectural. Age, period, and cohort trends are considered accounting variables, proxies for more meaningful explanatory factors that covary with these temporal variables.[52] Now that specific timing of the cohort and period effects has been identified, it is necessary to search for the underlying phenomena. Further elaboration of the historical and social context as well as biological environmental factors within each country are necessary to begin to understand the reasons for these trends. Specific hypotheses concerning the association of the rate of depression to mortality, fertility, marital stability, alcohol and other drug abuse, composition of the labor force, urbanization, and changes in family structure, as well as to possible toxic exposures or occult infectious agents in each site, can be postulated, and demographic, epidemiologic, and economic indices for some of these factors are available from each country. It is possible to compare these indices, relating the time trends within and across countries, and to determine age-specific vulnerability to events as they apply to the changing rate of major depression. Thus far, it is clear that major depression occurs across a broad range of cultures and that more recent generations are at increased risk. A national effort to improve the assessment, recognition, and treatment of major depression (DART) has been initiated by the NIMH in the United States. Our findings suggest that similar efforts may be needed in other parts of the world.

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Participating Investigators and Centers of the Cross-National Collaborative Group

The investigators and centers included the following: Myrna M. Weissman, PhD, Priya Wickramaratne, PhD, Steven Greenwald, MA, Hsiaoyun Hsu, MS, and Robert Ouellette, MPhil, College of Physicians and Surgeons, Columbia University, and New York State Psychiatric Institute, New York, NY; Lee N. Robins, PhD, Department of Psychiatry, Washington University School of Medicine, St Louis, Mo; Javier I. Escobar, MD, University of Connecticut School of Medicine, Farmington (data collected at University of California, Los Angeles); Roger Bland, MB, Stephen Newman, MD, and Helene Orn, BEd, Department of Psychiatry, University of Alberta, Edmonton; Glorisa Canino, PhD, and Maritza Rubio-Stipec, MA, Behavioral Sciences Research Institute, University of Puerto Rico, San Juan; Hans-Ulrich Wittchen, PhD, and Cecilia A. Essau, MA, Max Planck Institute of Psychiatry, Clinical Institute, Munich, Germany; Carlo Faravelli, MD, Guya Incerpi, MD, Benedetta Guerrini Degl'Innocenti, MD, Leandro Aiazzi, MD, and Stefano Pallanti, MD, Department of Neurology and Psychiatry, Florence University Medical School, Florence, Italy; Jean-Pierre Lépine, MD, Department of Psychiatry, Groupe Hospitalier Bichat-Claud-Bernard, Paris, France; Philip Pariente, MD, and Joseph Lellouch, PhD, Institut National de la Santé et de la Recherche Médicale, Villejuif, France; Elie Karam, MD, St Joseph University, St Georges Hospital, and American University of Beirut, Lebanon; J. Elisabeth Wells, PhD, Peter R. Joyce, PhD, Mark Oakley-Browne, MB, ChB, and John A. Bushnell, PhD, Departments of Community Health and General Practice and Psychiatry, Christchurch School of Medicine, Christchurch, New Zealand; Hai-Gwo Hwu, MD, Eng-Kung Yeh, MD, and Ly-Yung Chang, PhD, Department of Psychiatry, National Taiwan University, College of Medicine, Taipei, Taiwan; Gerald L. Klerman, MD,† and Andrew C. Leon, PhD, New York Hospital–Cornell Medical Center, New York, NY; Philip Lavori, PhD, and Meredith Warshaw, MSS, MA, Department of Psychiatry, Brown University, Providence, RI; and Wolfgang Maier, MD, Achim Marx, PhD, Dirk Lichtermann, MD, Jurgen Minges, MD, R. Heun, MD, and Jurgen Hallmayer, MD, Abteilung für Psychiatrie, University of Mainz, Mainz, Germany.

†Dr Klerman died on April 3, 1992.