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Review

Depression as a disease of modernity: Explanations for increasing prevalence

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ABSTRACT

There has been much speculation about modern environments causing an epidemic of depression. This review aims to (1) determine whether depression rates have increased and (2) review evidence for possible explanations. While available data indicate rising prevalence and an increased lifetime risk for younger cohorts, strong conclusions cannot be drawn due to conflicting results and methodological flaws. There are numerous potential explanations for changing rates of depression. Cross-cultural studies can be useful for identifying likely culprits. General and specific characteristics of modernization correlate with higher risk. A positive correlation between a country's GDP per capita, as a quantitative measure of modernization, and lifetime risk of a mood disorder trended toward significance ($p = 0.06$). Mental and physical well-being are intimately related. The growing burden of chronic diseases, which arise from an evolutionary mismatch between past human environments and modern-day living, may be central to rising rates of depression. Declining social capital and greater inequality and loneliness are candidate mediators of a depressiogenic social milieu. Modern populations are increasingly overfed, malnourished, sedentary, sunlight-deficient, sleep-deprived, and socially-isolated. These changes in lifestyle each contribute to poor physical health and affect the incidence and treatment of depression. The review ends with a call for future research and policy interventions to address this public health crisis.

Contents

Abbreviations: EEA, environment of evolutionary adaptedness; MDD, major depressive disorder; NCS, National Comorbidity Survey; NCS-R, National Comorbidity Survey Replication; MMPI, Minnesota Multiphasic Personality Inventory; GDP, gross domestic product; PUFA, polyunsaturated fatty acids; SAD, seasonal affective disorder.

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1. Introduction

Drastic changes in daily life over the past century are fueling the growing burden of chronic diseases, including atherosclerosis, hormone-related and gastrointestinal cancers, osteoporosis, and type 2 diabetes mellitus (Beckman et al., 2002; Eaton and III, 2004; Mokdad et al., 2001; Omenn, 2010; Smith, 2002). These diseases share a high-degree of co-morbidity and behavioral risk factors, are endemic to industrialized nations, and have been associated with a similar physiologic profile of metabolic and inflammatory dysregulation (Beckman et al., 2002; Coussens and Werb, 2002; Libby et al., 2002; Moussavi et al., 2007; Mundy, 2007; Must et al., 1999; Nicklas et al., 2005; Shoelson et al., 2007). Though there is evidence of some human evolution since the advent of agriculture ~10,000 years ago (Perry et al., 2007), *Homo sapiens* are considered to be most adapted to the diverse array of hunter–gatherer lifestyles characteristic of past evolutionary environments, collectively referred to as the environment of evolutionary adaptedness (EEA) (Barkow et al., 1992; Irons, 1998). The discrepancy between the modern environment and the human EEA serves as the theoretical foundation for understanding the ultimate etiology of the aforementioned chronic diseases (Eaton et al., 2002; Omenn, 2010; Smith, 2002). They are commonly called "diseases of modernity." As the leading cause of morbidity and mortality, diseases of modernity are the greatest threat to public health in the developed world (Yach et al., 2006). If the mismatch between contemporary and historic lifestyles adequately explains increasing lifetime risk of depression in the modern-industrialized world, then depression should be considered a disease of modernity as well.

"Modernity" is a continuous concept that begins with agriculture, followed by industrialization, urbanization, and ever-accelerating changes in technology and social structure. "Modernization" is loosely defined in this review as the conglomeration of a society's urbanization, industrialization, technological advancement, secularization, consumerism, and westernization. "Depression" refers to the symptoms that define major depressive disorder (MDD). This review addresses two fundamental questions: a) have depression rates increased? And (b) if so, why?

2. An epidemic of depression?

All diseases of modernity exhibit the *sine qua non* characteristic of an increasing incidence over time, because the environment continues to deviate further from the human EEA and individuals live longer within these novel environments. Depression is certainly not new, though its prevalence throughout human history is unknown. The affliction of sorrow, fright, and despondency exhibits remarkable historical continuity from ancient to modern times (Burton, 1845; Jackson, 1986). Evidence for or against the possibility of changing rates over millennia and centuries is wanting. In his encyclopedic account of the subtypes, causes, and treatments of melancholy, from the 17th century, Richard Burton notes its ubiquity:

> Being then a disease so grievous, so common, I know not wherein to do a more general service, and to spend my time better, than to prescribe means how to prevent and cure so universal a malady, an epidemical disease, that so often, so much crucifies the body and minds (Burton, 1845)

Systematic epidemiologic study of depression began in the 20th century. Unfortunately, measurement of clinical populations (rather than community sampling), recall bias of retrospective studies, and inconsistent findings from longitudinal surveys bedevil this research. In the 1960's, clinicians found that patients were younger, more neurotic, and less severely depressed than in earlier decades (Paykel et al., 1970; Rosenthal, 1966). It was suggested this reflected the social trend to view emotional problems as treatable psychiatric conditions and not merely part of the normal vicissitudes of life. The apparent rise in depression has been attributed to changes in diagnostic criteria that fail to account for the context of the symptoms, which has led to the misclassification of normal responses of sadness as a mental disorder (Horwitz and Wakefield, 2007). This review avoids this point of contention by only assessing rates of depression as currently defined symptomatically. A review of family and community studies revealed a higher lifetime probability of developing MDD and an earlier age-of-onset in younger cohorts (Klerman and Weissman, 1989). The largest community-based, cross-sectional studies of mental illness use retrospective methodology. They report a greater lifetime risk of mood disorders (Kessler et al., 2007) and, specifically, MDD in each successive generation (Andrade et al., 2003). A similar cohort effect was found in the US population in the National Comorbidity Survey Replication (NCS-R) (Kessler et al., 2003); although, 12-month prevalence estimates were lower than those measured a decade earlier in the original NCS (Kessler et al., 1996). The investigators attribute this discrepancy to methodological modifications implemented to reduce false-positives in the NCS-R (Kessler et al., 2003). The calculated risk of lifetime-prevalence from these retrospective studies likely reflects a significant degree of recall bias. People often exhibit poor recall and under-report past depressive episodes in community samples (Bromet et al., 1986), especially milder episodes for which no treatment was received (Simon and VonKorff, 1995; Wells and Horwood, 2004).

Longitudinal surveys are less susceptible to recall bias. A community-based study of American adults found the one-year prevalence of MDD rose from 3.33% to 7.06% between 1991–92 and 2001–02 (Compton et al., 2006). A meta-analysis of Minnesota Multiphasic Personality Inventory (MMPI) data of American college (N = 63,706) and high school (N = 13,870) students found that young adults were