

Are we studying the right populations to understand suicide?

Suicide ranks 13th among leading causes of years of life lost, with more than 800,000 deaths worldwide annually (1). Particularly alarming is that 5.3% of deaths among those 15-49 years old are self-inflicted (1). The highest suicide rates are reported in Eastern Europe and East Asian countries, while the lowest are reported in Latin American and Muslim countries (2), and suicide rates may vary sharply across neighboring countries. Although effective suicide prevention policies exist, they may need to be adjusted for these large geographic differences in suicidal behavior, possibly related to culture, but largely still unexplained (3).

Given the socio-economic and personal impact of suicide, one might expect countries with high suicide rates to invest in suicide research and prevention. This has been the case in the Scandinavian countries, which have made large investments to understand and prevent suicidal behavior and have reduced their suicide rates (4). Of note, Swedish suicide prevention policy plans were relatively less strongly implemented than Danish or Finnish ones, and suicide prevention among Swedish males with mental disorders failed (4). Certainly, causality cannot be inferred from temporal association, but the data are intriguing.

Nevertheless, the worldwide distribution of research investment in suicide shows little correspondence with actual suicide rates. As in most domains, suicide research productivity is clustered in North America and Europe. In fact, of 19,440 published articles recorded in the Web of Science with the keyword "suicide" during 2010-2014, 5802 (37.3%) were from U.S. institutions and 6944 (44.6%) from European Union institutions. In contrast, 6.0% of recent suicide studies are from India and China, although these countries account for more than one third of the world population and almost half of world's suicides (5,6).

An analogous pattern is found when examining European Union and U.S. suicide research in more detail. Almost half of the scientific production regarding suicide in the European Union is from countries with low base suicide rates (<10 suicides per 100,000), such as Italy, the Netherlands, Spain and the UK, that represent about one third of the total European Union population. Similarly, the geographic distribution of suicide researchers within the U.S. does not follow suicide rates at the population level. Most research is carried out in institutions of the East and West coast (notably the Northeast), while the states in the West, where suicide rates are highest, produce far less suicide research.

In the same vein, most suicide studies are carried out with urban samples, but the highest suicide rates are usually found in rural areas (7). An inverse example of this relationship is the effect of urbanization in China, which seems to explain the declining rates of suicides along the last decade (8).

Although the vast majority of suicides still occur in rural areas of low- and middle-income countries (5,6), the theoretical models of suicide, the recommended preventive interventions and the evidence about their effectiveness almost all come from urban institutions in high-income countries. The appropriateness of these models and interventions for low- and middle-income countries is uncertain.

Thus, most suicide research seems to be conducted in areas where suicide risk is lowest. As in any other field, regional differences in scientific output are correlated with research budgets and the size of the country's economy. However, because current suicide research is focused on low-risk populations, our capacity to build generalizable predictive and preventive models may be hindered. The limitations of suicide studies focused on a specific community can be illustrated by several facts.

First, the effect of life events on suicide risk is influenced by environmental or cultural factors. Losing a close relative or having financial problems seem to prompt different consequences for suicide risk depending on social networks, cultural reactions and even the economic climate in each country (2). This can be readily observed in the variability of suicide rates over time in different countries. For instance, South Korea has seen a dramatic increase in suicide rates, which have tripled (from <10 to around 30 suicides per 100,000) since the nineties (2,9). This escalation occurred in the context of economic growth, with country-specific factors – notably the unequal distribution of wealth affecting the elderly, the sensationalist media coverage of suicides, and the low rates of antidepressant treatment – appearing to play an important role in stoking the rise.

Second, the heritability of a broad suicidal phenotype including ideation, plans and attempts has been estimated to range from 30 to 50% (10). This variability likely reflects environmental effects, posited to modulate genetic predisposition to suicidal and other behaviors, but usually studied at the level of the individual's exposure to adversities in the environment (e.g., early childhood adversity) as opposed to more general environmental effects. Most of the growing literature on gene-environment interactions in suicidal behaviors focuses on individual life experiences in a particular community. However, the influence of social climate cannot be accurately measured if we do not compare distinct environments. For example, does corporal punishment have a different effect on children raised where it is culturally accepted compared to children raised where it is prohibited? Indeed, the effect of socio-cultural contexts on putative suicide risk factors, such as ethnicity or unemployment, may depend on ethnic density or employment rates, respectively (11). Moreover, risk factors for suicide may differ in high- and low-income countries (5),

but relevant site-specific findings may be disregarded because they are not disseminated in international scientific networks.

Third, the complexity of suicidal behavior is unlikely to be reflected in just a few variables, and studies combining factors in different dimensions to predict suicidal behavior have obtained discouraging results (12). Thus, the development of a robust model of suicidal behavior may require studies that include large samples and high-risk populations, most probably affected by gene-environment interactions. Unfortunately, multicentric studies including urban and rural areas are frequently hampered by unreliable data sources, disparate definitions of cause of death and, probably connected with social taboos and stigma, an underestimation of suicide deaths in many countries (13). In fact, one of the few cross-national studies on suicidal behavior, the World Health Organization's multisite intervention SUPRE-MISS, suggests that site-specific approaches to suicide prevention are needed given differences in prevalence of suicidal ideation and attempts (14).

In sum, if suicide research is only conducted in low-risk areas, the translation of these efforts into a global model of suicide behavior might prove problematic. International collaborations to boost suicide research are already under way, but so far they have been hindered by the use of divergent methodologies for the assessment of suicidal behavior. Collaborative approaches, consensual definitions and international expertise could foster suicide research and facilitate investigations in high-risk countries lacking resources and know-how.

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