In this issue of the Journal, Bjørngaard et al. give us new insights into the etiology of mental health by studying birth order and suicide risk (Am J Epidemiol. 2013;177(7):638–644). Although the authors provided empirical evidence that each increase in birth order (i.e., from first-born to second-born, second-born to third-born, etc.) is associated with a 46% higher suicide risk, they gave us very little information on the likely explanations. In our commentary, we draw attention to the possible mechanisms underlying a causal relationship between birth order and suicide. Given that Norway is one of the richest countries in the world, the findings of Bjørngaard et al. in a Norwegian cohort also call for a discussion of whether their results are representative of other societies that are similar or dissimilar with respect to economic institutions, social conditions, and political environment. We suggest that there are several plausible mechanisms to explain higher suicide rates among later-born children, but other mechanisms might also operate in the opposite direction, that is, have beneficial outcomes among later-born children. Specifically, there are reasons to expect a different relationship between birth order and psychiatric outcomes in poorer societal contexts.

MECHANISMS

Numerous studies have found a negative association between a higher birth order and various individual outcomes, such as intelligence, educational attainment, adult earnings, cognitive and noncognitive skills, and mortality risks (5–8). Previous research has also examined birth order in relation to suicide (9–13). Birth-order effects have been studied not only by epidemiologists but also by psychologists, economists, sociologists, demographers, and evolutionary scientists. The empirical evidence for more beneficial outcomes among first- or earlier-born children than among
later-born children is, if not entirely unequivocal, at least very strong. The problem rather lies in understanding the underlying mechanisms.

Although higher birth order has been linked to heightened risk of major suicide risk factors, such as schizophrenia, other psychoses, and depressive symptoms (14, 15), little is known about its links to suicide. We therefore stress some additional possible mechanisms and refer to insights from studies that examined other outcomes, such as educational attainment, labor market performance, and delinquency. After looking at such factors, it becomes clear that other mechanisms are expected to operate in the opposite direction, that is, to have beneficial outcomes among later-born children.

Bjørngaard et al. state that siblings lower in the birth order may benefit from a higher degree of stimulation and support during their early years (1). This accords with resource theory and suggests that resources are divided as the family grows larger (16, 17). Thus, children of high birth order are born into conditions characterized by restricted access to parental attention and supervision (18). Such limited access to parental time may, for instance, result in less attention paid to the health and safety of these children during their first years of life, including attention to their psychological health and signs of psychiatric deviations. Children who enjoy greater parental attention early in life may develop greater resilience to maladaptive responses to stressful events in adulthood (19). However, even if parents subdivide their resources equally among their offspring at any given point in time, the cumulative distribution of investment will be unequal among the offspring, favoring first-born and last-born children at the expense of middle-born siblings (20).

There is also a possibility of weaker attachment between later-born children and their parents because of parents’ limited time and emotional resources (21, 22). The infant or young child has a need for a secure relationship with adult caregivers, without which normal social and emotional development will not occur (21, 23). Lower levels of attachment to parents due to restrictions in quality time could give rise to emotional and behavioral problems, separation stress, and psychiatric disorders, thereby contributing to an increased suicide risk among later-born children.

Models of a different kind attribute the relation to prenatal or gestational factors (24, 25). The biological depletion of mothers and other risk factors in utero have been put forward as an explanation for the often-observed higher mortality rate of children born toward the end of large sibships. Increased maternal stress during the second and third pregnancy may have a negative influence on fetal brain development. High cortisol levels could have a lifelong influence on the hypothalamic-pituitary-adrenal axis, resulting in hypercortisolemia in adulthood, which has been linked to depression (13). Maternal antibody levels also tend to increase with higher birth orders, which could affect fetal development and suicide risk later in life.

Yet, there could be counteracting mechanisms. Although sociological and psychological studies almost exclusively find first-born children to be the most privileged children during upbringing, the biological advantage of later-born children in terms of their physical size at birth has also been documented (26, 27). Children born later are often heavier at birth, which makes them less prone to disease in adult life, including psychiatric diseases predictive of suicide. Because parents face different time and financial constraints over their lifetime, they may be prevented from equalizing their resources and investments across children. Increased parental earnings over the life cycle, on the other hand, suggest that later-born children will have more advantages than do their earlier-born siblings (28). They may also be more intellectually stimulated by growing up with older children and better-educated parents. The peer support provided by other siblings might have additional positive implications for mental wellbeing. Finally, if parents become better child caretakers as they gain experience, later-born children should benefit from better child-rearing practices, which could enhance these children’s confidence and psychological wellbeing.

Compared with previous research on birth order and suicide, one significant contribution of Bjørngaard et al. is their use of fixed-effects models. They ran Cox regressions stratified by the mother, which controlled for factors that siblings share within the family. These fixed family effects specifications use only the within-family variation in the outcome of interest and therefore neatly account for inherent problems in standard nonstratified models, such as the influence of genetic factors and environmental factors shared at childhood that are time-invariant. However, many of the potential mechanisms vary over time and cannot be adjusted for in the models. Parents face different time and financial constraints over their lifetimes that may prevent them from equalizing their resources and investments across children, and there could be a changing composition of parental characteristics that contribute to different home environments. Prenatal and gestational risk factors may differ between pregnancies. Factors observed at the individual level, such as the offspring’s own marital status, achieved socioeconomic status, or within-family socioeconomic order, together with epigenetic mechanisms may also be important for adult-aged offspring. Birth-order effects should then be incorporated into a life-course perspective that accounts for critical events and periods in the lives of both parents and offspring.

It is essential to replicate these findings from Norway, as the birth-order effect may depend on the country’s specific social, cultural, and historical context. Societies change and so do the internal lives of families. As fertility rates decline and family policies improve, the relative advantage of one birth order position over another may vanish or change. Variation across time and space may consequently help us clarify the mechanisms by which social disadvantage within families arises and how these mechanisms relate to certain societal features (5).

There are reasons to expect a different relationship between birth order and psychiatric outcomes in other societal contexts. Recent results from Ecuador, which is a poor country, show that first-born children remain behind in their human capital development from early childhood to adolescence, an effect that may be caused by less quality time with parents (29). Many of these children grow up in poor, low-educated families. Financial constraints and lack of resources may therefore drive parents to send their
children out to work (30). Because earlier-born children are more productive by virtue of their higher age, they are the ones most likely affected. If their earnings contribute to family resources that allow later-born children to further develop their human capital and go to school, one might expect positive birth-order effects on child schooling and negative birth-order effects on child labor (31). Accordingly, these conditions might contribute to a higher suicide risk among first-born offspring because of higher pressures and demands from parents and family. Poverty therefore seems to be a likely driver behind the birth order divide observed between developing and developed countries, but it remains to be seen whether birth-order effects are also consistent across countries that are economically and socially more similar.

**IMPLICATIONS**

The strong association between birth order and suicide found by Bjørngaard et al. (1) is intriguing, although it does not tell us a great deal about the mechanisms at play. We consider it essential to establish whether there is a birth-order effect with respect to other specific diseases and causes of death as well. Associations between birth order and chronic diseases such as cancer, myocardial infarction, stroke, etc., might indicate that biological factors are important, whereas effects on suicide could be due to both biological and social factors. It is furthermore relevant to include attempted suicides. They tend to be up to 20 times more frequent than completed suicides (3) and thus might show an even stronger association with birth order (9).

Other important issues concern the role of gender and adult socioeconomic position. Bjørngaard et al. claim to have found no evidence that the impact of birth order differs between male and female siblings (1). It is not clear, however, whether this statement refers to the trend variable used, which means it is possible that gender-specific birth-order effects are not monotonous. In light of the large overall difference in suicide rates between men and women, it would seem somewhat surprising if the birth-order effect were to have no gender dimension whatsoever. Some kind of interpretation of this remarkable finding would seem to be warranted. We know that men and women differ in biological predispositions, gender roles, and social circumstances. Considering women’s often greater roles and responsibilities within the family, one might expect the gender composition of the family to play an important part, particularly the gender of the first-born child.

Additionally, it might be relevant to examine whether the associations vary by income, educational level, and occupational status even within more affluent societies, considering that the relationship might be reversed in contexts characterized by poverty and lack of resources. Trying to scrutinize whether associations vary by neighborhood socioeconomic deprivation in such countries is another avenue for future research. There may be features of poorer families or disadvantaged neighborhoods in rich societies that benefit the mental health of later-born siblings as compared with first-born children.

Understanding the mechanisms that link birth order and suicide is of great importance to designing policy. However, trying to reduce differences between siblings based on birth order presumes a deeper understanding of why such associations occur. Bjørngaard et al. interpreted their findings by concluding that family factors not shared by siblings may operate from an early age and influence the suicide risk. If effects by sibling order were found that originated in prenatal biological factors, parental education and additional screening of older mothers could limit birth-order effects. If, on the other hand, restricted access to parental attention and supervision underlie the association, it could be more important to teach parents how to distribute time and resources between children or to provide societal support for families with many children. Finally, if there are country-specific patterns in the birth-order effect, policies in some societies should be more focused on first-time mothers and their first-born offspring.

**ACKNOWLEDGMENTS**

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M.R. was supported by the Swedish Council for Working Life and Social Research (grant number 2009-0547) and the Swedish Research Council (grant number 421-2011-1649).

Conflict of interest: none declared.

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