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Environment International

Correspondence

Comment on "Green Space, health inequality, and pregnancy"

We read with great interest a recent *Environment International* article—Green Space, health inequality, and pregnancy—which explores the relationship between greenness around a mother's home, proximity to green space, and pregnancy outcomes in Barcelona (Dadvand et al., in press). The authors were clearly unaware of a similar study that we recently published on urban-tree cover, proximity to green space, and pregnancy outcomes in Portland, Oregon (Donovan et al., 2011). When we conducted our study, we didn't know about the parallel research being conducted in Spain. Unfortunately, this mutual ignorance meant that neither research team had the opportunity to interpret their results in light of the other's findings. The purpose of this correspondence is to briefly compare and contrast the methods and results of the two studies.

Dadvand et al. analyzed 6465 singleton live births that occurred between January 2001 and June 2005 at a major teaching hospital in Barcelona. They measured greenness in a 100 m buffer around the maternal address using the Normalized Vegetation Index (NVDI), which has a resolution of 30 m. In addition, they created a dummy variable denoting whether a maternal address was within 500 m of a major green space. Finally, they controlled for (or stratified by) a broad range of demographic and maternal-health variables. Results showed that proximity to green space, and greenness around a mother's home, were positively associated with birth weight but only for women with the lowest level of education. Neither variable was related to gestational age.

In Donovan et al., the sample consisted of 5696 singleton live births that occurred in 2006 or 2007 in Portland, Oregon. The mean gestational age was 39 weeks (40 weeks in Dadvand et al.) and the mean birth weight was 3425 g (3230 g in Dadvand et al.). We measured tree-canopy cover in 50, 100, and 200 m buffers around the maternal address using classified aerial imagery, with a resolution of 1 m, and calculated the distance to the nearest public and private open space. We controlled for a similar, although not identical, range of covariates. In contrast to Dadvand et al., we didn't model birth weight and gestational age continuously. Rather, we used dummy variables to denote pre-term births (less than 37 weeks) and small-for-gestational-age (SGA) births (birth weight below the 10th percentile for gestational age and gender) and estimated two logit models. Results showed that tree-canopy cover within 50 m of a mother's house, and distance to private open space, were associated with a reduced probability of a SGA birth. Neither variable influenced the probability of a pre-term birth.

What is most striking about the two studies is the remarkable consistency of their results. The studies were conducted in different countries, greenness and access to green space were measured differently, and the studies employed different statistical techniques. Despite these differences, both studies found that greenness and access to green space were associated with increased birth weight.

Dadvand et al. only found a relationship between greenness and birth weight among women with low levels of education. In contrast, we found a relationship across education levels, although we did find that mothers without a college education were more likely to have SGA births. This may reflect a difference in the relationship between greenness and birth weight in Spain, it may be because of differences in the resolution of the greenness measures used (1 m versus 30 m), the statistical models employed (linear versus logit), or different greenness measures (we only measured tree canopy, whereas Dadvand et al. used a more general measure of greenness).

Neither study provides direct insight into how greenness influences birth outcomes. However, both point out that increased physical activity is unlikely to be the only mechanism, as exercise is seldom limited to a 50 or 100 m buffer around a mother's home. However, both studies also found that proximity to open space improves birth outcomes, which suggests that exercise, while probably not the sole mechanism, may be one of the ways by which greenness improves maternal health. It is interesting to note that other possible mechanisms—such as stress reduction, increased social contacts, air-quality improvements, noise abatement, and a reduction in the heat-island effect—influence a broad range of health outcomes. This suggests that future research could fruitfully examine the relationship between the natural environment and other measures of public health.

In conclusion, when taken together, these two studies strongly suggest that the natural environment can positively influence reproductive health. In addition, they reinforce the value of approaching the same research question from different perspectives.

References

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