



Editorial

Gaia meets Asclepius: Creating healthy places



1. Public health policy and the landscape

Thanks in part to the science published in *Landscape and Urban Planning*, the world is taking note of the wide-ranging health impacts that landscapes can convey. It is as though Gaia, the Greek goddess who personified Earth, has set up a regular meeting with Asclepius, the god of medicine, healing, and rejuvenation. The most recent example comes from the American Public Health Association (APHA), which has adopted a policy entitled Improving Health and Wellness through Access to Nature (Chawla & Litt, 2013).

The APHA policy makes recommendations that promote healthy and active lifestyles and encourage land use decisions that prioritize access to natural areas and green spaces for people of all ages, abilities, and income levels. These recommendations call on health professionals to raise awareness among patients and the public at-large of the health benefits of spending time in nature. They also urge health professionals to form partnerships with community stakeholders, such as park departments, school districts, and nature centers. The policy even calls for more naturalistic landscape planting in people's yards and workplaces, the development of natural playscapes for children, and the participatory engagement of adults and children with natural vegetation in community and school gardens.

Why would the APHA be motivated to adopt such a far-reaching policy? To what extent is this policy science based? Which of its elements still need to be further explored so that practitioners can be confident in planning and designing places that enhance the health of individuals, families, and communities? We address these questions here.

2. Linking research, policy, and practice

The American Public Health Association is a non-profit professional association that works to promote the health of individuals, families, and communities; to control or eliminate preventable death and suffering; and to eliminate health disparities. APHA represents a wide array of health providers and officials, scientists, and educators. Its 50,000 members and affiliates work with the US Congress, regulatory agencies, and the states to ensure that public health is a priority in the legislative and policy-making process.

Current priority issues for APHA include emergency preparedness, climate change, food safety, hunger and nutrition, disease control, international health, and tobacco control. As a logical extension of this larger agenda and in recognition of the role of the physical environment in people's health and well-being, the

Association adopted its policy encouraging people to have regular contact with nature and green spaces.

The APHA's new policy argues that access to nearby nature is "related to lower levels of mortality and illness, higher levels of physical activity outdoors, restoration from stress, a greater sense of well-being, and greater social capital" (p. 2). The policy statement presents a review of much of the relevant literature (including 71 citations) and considers alternative explanations regarding the findings presented in the review. In other words, the policy grows directly from the science.

APHA's science-based advocacy is part of a larger, global trend of non-profit organizations and governmental agencies marshaling the research in fields related to environment, behavior and design to create healthier landscapes and healthier people. The National Environmental Education Foundation, for instance, has a Health and Environment program that works to "advance environmental knowledge among health professionals to improve the public's health with a special emphasis on children in underserved populations" (National Environmental Education Foundation, 2014). The Children and Nature Network seeks to "connect all children, their families and communities to nature through innovative ideas, evidence-based resources and tools" (Children & Nature Network, 2014). In Australia, Parks Victoria assertively promotes its Healthy Parks, Healthy People program telling visitors that "Spending time in the natural environment—in places like parks—is good for your mind, body and soul" (Parks Victoria, 2014).

In these four examples, scientific findings published in *Landscape and Urban Planning* and other peer-reviewed journals provide the bulk of the evidence in support of various policies or recommendations.

The research is also having an impact on practice. In the UK, for instance, Liverpool started a program called Natural Choices for Health and Wellbeing that has provided support to nearly 40 community groups who demonstrated that their efforts improve well-being by connecting people to the natural environment (Mersey Forests, 2014). Another example comes from Enniskillen, Northern Ireland, where an important goal in the development of a new hospital was to create a site design that was an integral part of the healing process (LUC Environmental Planning Design & Management, 2014).

Taiwan is awash with public and private sector examples of landscapes that are designed to promote human health. There are dozens of healing gardens at hospitals, universities, and Buddhist temples. In an effort to promote contact with nature for its highly urbanized population, the Taiwan Council of Agriculture has

created 75 agro-tourism districts in which farmers have redesigned a portion of their farms. These Leisure Farms are designed to connect people to nature and in doing so, promote their health and well-being (Taiwan Today, 2014).

3. Pressing questions

That our scientific findings are being deployed to create healthier places and individuals is deeply satisfying. Can we now sit back with another Greek God—Dionysus—and enjoy the fruits of our labors? Or are there other important questions that need to be addressed?

We argue there are many pressing questions. Some of the questions concern exposure to nearby nature. Others concern the health outcomes of such exposure. Still others concern the groups of people whose health might be impacted by nearby nature. Perhaps most important are questions that examine the relationship between healthy landscapes and healthy people.

3.1. What is the correct exposure?

Health professionals need to know which medication to administer, at what dose, in what form, by what route, and at what frequency. But when nature contact is the “medicine,” we rarely possess this knowledge. It is well established that exposure to nature enhances recovery from stressful events (Chang & Chen, 2005; van den Berg & Custers, 2011; Ward Thompson et al., 2012), but the devil is in the details (Frumkin, 2013). Do people need to view leafy trees, or does a wintertime look at denuded trees do the trick? Are trees necessary, or will shrubs suffice? What density of trees is needed? How close to nature do people need to be? For how long should a view last? Is a view sufficient, or is there additional value from smelling and touching vegetation or even hearing nature? Are indoor plants as effective as outdoor vegetation? What about exposures other than trees—say, to rain gardens, bioswales, green roofs, water features, or green streets and alleys?

These outstanding questions on exposures correspond to what epidemiologists call “exposure assessment”:

- What *type* of nearby nature most effectively promotes health?
- What *concentration* – or density – of nearby nature is necessary to promote health?
- What *duration* of exposure to nearby nature best promotes health?
- What *frequency* of exposure to nearby nature is necessary to promote health?
- What *exposure pathways* (visual versus tactile? direct versus through a window versus on a screen?) effectively promote health?

We could create healthier, more sustainable settlements if we had this information about exposure to nearby nature. This would also increase the extent to which we engaged in evidence-based landscape architecture (Brown & Corry, 2011). That is, we could increase the proportion of designs that are informed by evidence and factual information rather than on beliefs and hunches.

3.2. What outcomes result?

Some questions concern the health outcomes that grow from exposure to nearby nature. We have good evidence that exposure to nearby nature helps people recover from attentional fatigue (Berman, Jonides, & Kaplan, 2008; Matsuoka, 2010) and stress (Fan, Das, & Chen, 2011). There is also a growing literature indicating that nearby nature is positively associated with stronger neighborhood

social ties (Holtan, Dieterlen, & Sullivan, 2014) and physical activity (Coon, Boddy, Whear, Barton, & Depledge, 2011), and negatively associated with depression (Galea, Ahern, Rudenstine, Wallace, & Vlahov, 2006). Other suggested associations—say, with birth weight (Dadvand, Sunyer, & Basagana, 2012) or heart disease (Donovan, Butry, & Michael, 2013)—are tentative, harder to explain, and in need of further research.

Several challenges remain. Our understanding of the *mechanisms* through which the benefits are produced is sparse. We need a more detailed understanding of the mechanisms through which exposure to nature impacts attention restoration, stress reduction and immunization, increased social interaction, and higher levels of physical activity.

Moreover, for each of these outcomes, we do not know the *dose-response relationship* that would quantify the benefits of nearby nature. It is probably not important that we find the maximum dose of nearby nature that people can live with in a healthy fashion. But learning more about the minimum dose does seem important. At what dose of nearby nature do 50% of high school students significantly improve their attentional functioning? At what dose of nearby nature do 50% of adults show physiological recovery from a stressful event? Is the optimal dose of nature for promoting strong ties among neighbors different than the dose that promotes physical activity? We should ask similar questions about each major health benefit of nature contact.

3.3. Who benefits?

Some questions center around who benefits from various forms of exposure to nearby nature. Are the health benefits of exposure to nearby nature consistent across a person's life, or are there various ages when nature exposure is more or less important? For instance, might teenagers benefit from exposures that are unhelpful, or even harmful, for older individuals?

How do different ethnic and cultural groups respond to varying exposures to nearby nature? In what ways does exposure to nearby nature impact the health and well-being of individuals who are institutionalized, such as people who are incarcerated or individuals who are suffering from some long-term disease? What are the health implications of everyday exposure to nearby nature for people living in poverty? Here again, we know too little about the health implications of the amount of nearby nature we expose ourselves to on a daily basis.

3.4. In what ways do healthy landscapes relate to healthy people?

Our final questions concern the nexus of ecological health and human health. Although we know that people prefer and benefit from greener landscapes, we understand little about the impact of ecologically healthy landscapes on human health and well-being. Biologically diverse, native landscapes contribute a great deal to the overall ecological integrity and resilience of a setting, but to what extent do these aspects of healthy landscapes also promote human health? What are the human health implications of being exposed to native versus non-native or invasive species? Under what conditions do the requirements for maintaining ecologically healthy landscapes coexist with the requirements of human health within urban areas? What are the psychological and physiological impacts of exposure to urban and suburban landscapes that support ecological health?

To what extent do landscapes of high ecological integrity exact a cost on humans who are exposed to such places? Do such landscapes make many users feel unsafe? Does the “messiness” of such places, the number of insects, noises at night, or other characteristics reduce the benefits of nature exposure? If so, are there

strategies (e.g., cues to care or information) that can mediate such costs?

Although the need for this information is apparent, few empirical studies have attempted to integrate measures of ecological health and human well-being (Fuller et al., 2007).

4. A call to action

Clearly, we have our work cut out for us. Gaia and Asclepius must keep meeting. As the APHA policy on nature suggests, putting this new knowledge into practice will be enhanced as design professionals and health professionals work with scholars to advance our knowledge about the health benefits of exposure to green places.

We need additional research on multiple fronts. Answering the questions posed here will advance our understanding of the relationship between nearby nature and human health. That evidence-based understanding will, in turn, equip us to create healthier, more supportive communities through out the world.

We need to ensure that the findings of this research are widely accessible. To this end, the editors of *Landscape and Urban Planning* should work to get the journal indexed by PubMed, the National Institute of Health's citation index, and encourage more scholars to publish articles about landscapes and health here.

Regular exposure to nearby nature offers hope and health to individuals and communities grappling with high levels of stress, mental fatigue, social isolation, rising rates of obesity, and sedentary behavior. APHA's policy on nature contact, the Leisure Farms in Taiwan, and the built work in Europe and Australia recognize both the science developed in recent years and the potential public health benefits of acting on that science. But we should not let these public and non-governmental organizations do all the advocacy work for us. As scholars and practitioners, we should make connections with health providers, elected officials, and design professionals. We should also collaborate in developing evidence-based design guidelines and incorporating nature contact into the places we create. Doing so will help improve the health and well-being of the public we all serve. That's an outcome worthy of Gaia and Asclepius.

References

- Berman, M. G., Jonides, J., & Kaplan, S. (2008). The cognitive benefits of interacting with nature. *Psychological Science*, 19(12), 1207–1212.
- Brown, R. D., & Corry, R. C. (2011). Evidence-based landscape architecture: The maturing of a profession. *Landscape and Urban Planning*, 100, 327–329.
- Chang, C. Y., & Chen, P. K. (2005). Human response to window views and indoor plants in the workplace. *Hortscience*, 40(5), 1354–1359.
- Chawla, L., & Litt, J. (2013). *Improving health and wellness through access to nature*. American Public Health Association. Retrieved from <http://www.apha.org/advocacy/policy/policysearch/default.htm?id=1453>
- Children and Nature Network. (2014). *About us*. Retrieved from <http://www.childrenandnature.org>
- Coon, J. T., Boddy, K., Stein, K., Whear, R., Barton, J., & Depledge, M. H. (2011). Does participating in physical activity in outdoor natural environments have a greater effect on physical and mental wellbeing than physical activity indoors? A systematic review. *Environmental Science and Technology*, 45(5), 1761–1772.
- Dadvand, P., Sunyer, J., Basagaña, X., Ballester, F., Lertxundi, A., Fernández-Somoano, A., et al. (2012). Surrounding greenness and pregnancy outcomes in four Spanish birth cohorts. *Environmental Health Perspectives*, 120, 1481–1487.

- Donovan, G. H., Butry, D. T., Michael, Y. L., Prestemon, J. P., Liebhold, A. M., Demetrios, G., et al. (2013). The relationship between trees and human health: Evidence from the spread of the emerald ash borer. *American Journal of Preventive Medicine*, 44(1), 139–145.
- Fan, Y., Das, K. V., & Chen, Q. (2011). Neighborhood green, social support, physical activity, and stress. *Health and Place*, 17, 1202–1211.
- Frumkin, H. (2013). The evidence of nature, the nature of evidence. *American Journal of Preventive Medicine*, 44, 196–197.
- Fuller, R. A., Irvine, K., Devine-Wright, P., Warren, P. H., & Gaston, K. J. (2007). Psychological benefits of greenspace increase with biodiversity. *Biology Letters*, 3, 390–394.
- Galea, S., Ahern, J., Rudenstine, S., Wallace, Z., & Vlahov, D. (2006). Urban built environment and depression: A multilevel analysis. *Journal of Epidemiological and Community Health*, 59, 822–827.
- Holtan, M. T., Dieterlen, S. L., & Sullivan, W. C. (2014). Social life under cover: Tree canopy and social capital in Baltimore, Maryland. *Environment & Behavior*, 46(6), 1–24. <http://dx.doi.org/10.1177/0013916513518064> (in press)
- LUC Environmental Planning Design & Management. (2014). *South West Acute Hospital, Enniskillen*. Retrieved from <http://www.landuse.co.uk/project/south-west-acute-hospital-enniskillen#UyhZfTyzK7E>
- Matsuoka, R. H. (2010). Student performance and high school landscapes. *Landscape and Urban Planning*, 97(4), 273–282.
- Mersey Forests. (2014). *Natural choices for health and wellbeing*. Retrieved from <http://www.merseyforest.org.uk/our-work/natural-choices-for-health-and-wellbeing/>
- National Environmental Education Foundation. (2014). *Health & environment*. Retrieved from <http://www.neefusa.org/health>
- Parks Victoria. (2014). *Healthy parks, healthy people*. Retrieved from <http://parkweb.vic.gov.au/about-us/healthy-parks-healthy-people>
- Taiwan Today. (February 7, 2014). COA targets Taiwan leisure farms for development. *Taiwan Today*. Retrieved from <http://taiwantoday.tw>
- van den Berg, A., & Custers, M. H. G. (2011). Gardening promotes neuroendocrine and affective restoration from stress. *Journal of Health Psychology*, 16(1), 3–11.
- Ward Thompson, C., Roe, J., Aspinall, P., Mitchell, R., Clow, A., & Miller, D. (2012). More green space is linked to less stress in deprived communities: Evidence from salivary cortisol patterns. *Landscape and Urban Planning*, 105, 221–229.

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