



2020

## Appalachian Environmental Health Literacy: Building Knowledge and Skills to Protect Health

Anna G. Hoover

*University of Kentucky College of Public Health, [anna.hoover@uky.edu](mailto:anna.hoover@uky.edu)*

Annie Koempel

*University of Kentucky Department of Dietetics and Human Nutrition, [ann.koempel@uky.edu](mailto:ann.koempel@uky.edu)*

W. Jay Christian

*University of Kentucky College of Public Health, [jay.christian@uky.edu](mailto:jay.christian@uky.edu)*

Kimberly I. Tumlin

*University of Kentucky College of Public Health, [kimberly.tumlin@uky.edu](mailto:kimberly.tumlin@uky.edu)*

Kelly G. Pennell

*University of Kentucky College of Engineering, [kellypennell@uky.edu](mailto:kellypennell@uky.edu)*

Follow this and additional works at: <https://uknowledge.uky.edu/jah>



Part of the [Appalachian Studies Commons](#), [Community Health and Preventive Medicine Commons](#),

[See next page for additional authors](#)

[Environmental Health Commons](#), [Environmental Health and Environmental Education Commons](#), [Environmental Health Commons](#), [Environmental Health and Protection Commons](#), [Environmental Public Health Commons](#), [Health Communication Commons](#), [Inequality and Stratification Commons](#), [Information Literacy Commons](#), [Nutrition Commons](#), [Public Health Education and Promotion Commons](#), and the [Rural Sociology Commons](#)

### Recommended Citation

Hoover AG, Koempel A, Christian WJ, et al. Appalachian environmental health literacy: building knowledge and skills to protect health. *J Appalach Health* 2020;2(1):47–53. DOI: <https://doi.org/10.13023/jah.0201.06>.

Copyright © 2020 Anna G. Hoover, Annie Koempel, W. Jay Christian, Kimberly I. Tumlin, Kelly G. Pennell, Steven Evans, Malissa McAlister, Lindell E. Ormsbee, and Dawn Brewer

This Notes from the Field is brought to you for free and open access by the College of Public Health at the University of Kentucky.

---

# Appalachian Environmental Health Literacy: Building Knowledge and Skills to Protect Health

## Abstract

Environmental health literacy (EHL) is an emerging, multidisciplinary field that promotes understanding of how environmental exposures can affect human health. After discussing the regional relevance of environmental health knowledge and skills, this article describes three ongoing Appalachian projects that are focused on measuring and building EHL.

## Keywords

environmental health, environmental health literacy, risk communication, health communication, Appalachia

## Creative Commons License



This work is licensed under a [Creative Commons Attribution 4.0 License](https://creativecommons.org/licenses/by/4.0/).

## Cover Page Footnote

Research and projects reported in this publication were supported by the National Institutes of Health through the National Institute of Environmental Health Sciences under UK-CARES Grant P30 ES02659 and UK Superfund Research Center Award Number P42ES007380, as well as through National Library Of Medicine Award Number G08LM013185. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. Dr. Hoover reports grants from NIH/National Institute of Environmental Health Sciences and NIH/National Library of Medicine during and related directly to the conduct of the study, as well as other grants from the Robert Wood Johnson Foundation, personal fees from NIH/National Institute of Environmental Health Sciences for consultancy work on grants at other academic institutions, and personal fees from NIH/National Institute of Environmental Health Sciences Scientific Review Groups service. Dr. Brewer and Ms. Koempel report grants from NIEHS/NIH grant P42ES007380 during the conduct of the study. Dr. Tumlin, Ms. McAlister, and Mr. Evans report grants from NIH/National Library of Medicine during the conduct of the study.

## Authors

Anna G. Hoover, Annie Koempel, W. Jay Christian, Kimberly I. Tumlin, Kelly G. Pennell, Steven Evans, Malissa McAlister, Lindell E. Ormsbee, and Dawn Brewer

## INTRODUCTION

Well-documented health disparities in Appalachia include high incidence of diabetes, obesity, high blood pressure, and cancer.<sup>1-3</sup> The most recent release of *America's Health Rankings* places Central Appalachia in particular near the bottom of all U.S. states in health outcomes, with Tennessee 42nd, West Virginia 44th, and Kentucky 45th among the 50 states.<sup>4</sup> Similarly, *County Health Rankings* places six of Virginia's seven Central Appalachian counties in the state's bottom quartile for health outcomes.<sup>5</sup>

Many chronic health conditions disproportionately experienced across the region have been linked to environmental contaminants.<sup>6-8</sup> Central Appalachia's historical economic reliance on mining, agriculture, and other industries has provoked concerns about how environmental exposures may contribute to regional health disparities. Research has found heightened levels of sulfur dioxide and other acidic particles in air samples,<sup>9,10</sup> while community members have voiced water quality concerns in several studies.<sup>11-13</sup>

Deteriorating infrastructure,<sup>14</sup> inappropriate waste disposal,<sup>15</sup> and potential occupational exposure risks<sup>16</sup> compound the need for at-risk populations to receive clear, timely, and accessible information about potential environmental health threats. Transforming complex scientific evidence into useful, understandable, and readily available resources and tools is essential to helping the people and communities of Appalachia make informed, health-protective decisions about their environment.

Environmental health literacy (EHL) is an emerging field that brings together content and methods from health, social, and environmental sciences to promote understanding of how environmental exposures can affect human health.<sup>17,18</sup> Such understanding can spur actions to minimize exposures and improve health outcomes. Local health department staff, healthcare providers, Cooperative Extension agents, librarians, journalists, and others play critical roles in sharing evidence-based information that can help build EHL.

Land-grant institutions are well positioned to help Appalachian organizations access and share information to improve regional EHL. The University of Kentucky (UK), for example, houses many initiatives that address regional environmental, health, and socioeconomic challenges. Spearheaded by faculty and staff from the Colleges of Public Health and Engineering, the Department of Dietetics and Human Nutrition, and the Kentucky Water Resources Research Institute, UK teams are conducting three NIH-funded, stakeholder-engaged studies that strive to measure and build regional EHL.

**Assessing EHL in Appalachia** is a pilot study supported by the National Institute of Environmental Health Sciences (NIEHS) through the UK Center for Appalachian Research in the Environmental Sciences (UK-CARES) that addresses the intersection of EHL and water quality. Researchers are leveraging local knowledge from water utility operators and watershed volunteers to identify the knowledge and skills people need to protect their health in the event of water contamination. This study will produce one of the first validated EHL measurement instruments.

**Protect Your Body from Pollution with a Healthy Lifestyle (Body Balance)**, a project of the NIEHS-funded UK Superfund Research Program, seeks to increase EHL by educating people about food strategies that may reduce exposures and decrease harmful exposure-related health effects.<sup>19</sup> Implemented by Cooperative Extension Service Family and Consumer Sciences (FCS) agents, the seven-lesson curriculum encourages consumption of plant-based foods believed to decrease inflammation and oxidation linked to exposures.<sup>20</sup> The curriculum also encourages consumption of lean meats and dairy products as high-fat animal products tend to contain higher concentrations of pollutants.<sup>21</sup> Body Balance is available to FCS agents in all 120 Kentucky counties.

**Integrating Information Resources to Increase EHL in Appalachian Eastern Kentucky**, funded by the National Library of Medicine, finds investigators working with Eastern Kentucky residents—including public health and healthcare stakeholders—to assess and improve existing environmental health-related risk maps and other information resources. The study answers calls to bridge knowledge and skills gaps by bringing together scientists, regulatory agencies, and community members to develop and disseminate accessible, understandable, and useful information.

At its roots, EHL is context-specific. Communities face diverse health risks from assorted contaminants traveling varied pathways to expose different populations, and these risks must be addressed within unique social, economic, and political contexts. Community residents understand these contexts far better than anyone else. By taking a stakeholder-engaged approach to EHL, the projects described in this article are harnessing local knowledge to help ensure that people in the Appalachian region have the evidence-based, culturally competent guidance that they need to make decisions about both their health and their local environment.

## SUMMARY BOX

**What is already known about this topic?** Appalachia's history of health disparities, along with potential linkages between some diseases and environmental contaminants, underscores the need for residents to have information, knowledge, and skills to protect themselves from potential environmental health threats. Local health departments and other community organizations play key roles in sharing information about these topics.

**What is added by this report?** This report describes three ongoing projects designed to build environmental health literacy and improve available environmental health information resources in the region.

**What are the implications for public health practice, policy, and research?** Stakeholder-engaged approaches can increase access to better information and help build environmental health literacy in Appalachia, ultimately leading to evidence-informed individual and community decisions.

## REFERENCES

1. Halverson JA, Ma L, Harner EJ. An analysis of disparities in health status and access to health care in the Appalachian region [Internet]. Appalachian Regional Commission. 2004. Available from: [https://www.arc.gov/research/researchreportdetails.asp?REPORT\\_ID=82](https://www.arc.gov/research/researchreportdetails.asp?REPORT_ID=82)
2. Seeger RS, Luu H, Christian WJ. Health disparities in the Commonwealth, A report on race and ethnicity and health in Kentucky [Internet]. Foundation for a Healthy Kentucky. 2016. Available from: [https://www.healthy-ky.org/res/images/resources/BRFSS-RACE\\_FINAL.pdf](https://www.healthy-ky.org/res/images/resources/BRFSS-RACE_FINAL.pdf)
3. Hendryx M, Fedorko E, Anesetti-Rothermel A. A geographical information system-based analysis of cancer mortality and population exposure to coal mining activities in West Virginia, United States of America. *Geospatial Health*. 2010 May;4(2):243–56. DOI: 10.4081/gh.2010.204. PubMed PMID: 20503192.
4. United Health Care. America's health rankings, annual report 2018 [Internet]. United Health Care. 2018. Available from: [https://assets.americashealthrankings.org/app/uploads/2018ahrannual\\_020419.pdf](https://assets.americashealthrankings.org/app/uploads/2018ahrannual_020419.pdf)
5. University of Wisconsin. 2019 county health rankings key findings report [Internet]. University of Wisconsin. 2019. Available from: <https://www.countyhealthrankings.org>
6. Chowdhury R, Ramond A, O'Keeffe LM, et al. Environmental toxic metal contaminants and risk of cardiovascular disease: systematic review and

- meta-analysis. *BMJ* 2018 Aug 29;362:k3310. DOI: 10.1136/bmj.k3310. PMID: 30158148; PMCID: PMC6113772.
7. Park SS, Skaar DA, Jirtle RL, Hoyo C. Epigenetics, obesity and early-life cadmium or lead exposure. *Epigenomics-UK* 2017;9(1):57–75. Doi: 10.2217/epi-2016-0047.
  8. Ruiz D, Becerra M, Jagai JS, Ard K, Sargis RM. Disparities in Environmental Exposures to Endocrine-Disrupting Chemicals and Diabetes Risk in Vulnerable Populations. *Diabetes Care*. 2018;41(1):193–205. DOI: 10.2337/dc16-2765. Epub 2017 Nov 15. PMID: 29142003; PMCID: PMC5741159.
  9. Spengler JD, Koutrakis P, Dockery DW, Raizenne M, Speizer FE. Health effects of acid aerosols on North American children: air pollution exposures. *Environ Health Persp* 1996;104(5):492–9. DOI: 10.1289/ehp.96104492. PMID: 8743436; PMCID: PMC1469351.
  10. Aneja VP, Isherwood A, Morgan P. Characterization of particulate matter (PM10) related to surface coal mining operations in Appalachia. *Atmos Environ* 2012;54:496–501. DOI:10.1016/j.atmosenv.2012.02.063.
  11. Hendryx M. The public health impacts of surface coal mining. *Extr Ind Soc* 2015 Dec;2(4):820–6. DOI: 10.1016/j.exis.2015.08.006.
  12. Hendryx MS. Health and the physical environment. In: Ludke RL, Obermiller PJ, editors. *Appalachian Health and Well-Being*. Lexington KY: University Press of Kentucky; 2012. p. 400. p. 47–66. ISBN-13: 978-0813135861.
  13. Blakeney AB, Marshall A. Water quality, health, and human occupations. *Am J Occup Ther* 2009;63(1):46–57. DOI: 10.5014/ajot.63.1.46.
  14. Ray T. Drinking water problems still plague Eastern Kentucky [Internet]. *Appalachian Voices*. 2016. Available from: <http://appvoices.org/2016/05/06/drinking-water-problems-plague-eastern-kentucky/>.
  15. Arcipowski E, Schwartz J, Davenport L, Hayes M, Nolan T. Clean water, clean life: promoting healthier, accessible water in rural Appalachia. *J Contemp Water Res Educ* 2017;161(1):1–18. DOI: 10.1111/j.1936-704X.2017.3248.x.
  16. Krometis LA, Gohlke J, Kolivras K, Satterwhite E, Marmagas SW, Marr LC. Environmental health disparities in the Central Appalachian region of the United States. *Rev Environ Health* 2017;32(3):253–66. DOI: 10.1515/reveh-2017-0012.
  17. Finn S, O'Fallon L. The emergence of environmental health literacy-from its roots to its future potential. *Environ Health Persp* 2017;125(4):495–

501. DOI: 10.1289/ehp.1409337. Epub 2015 Jun 30. PMID: 26126293; PMCID: PMC5382009.
18. Hoover AG. Defining environmental health literacy. In: Finn S, O'Fallon LR, editors. *Environmental Health Literacy*. Cham, Switzerland: Springer; 2019. p. 3–18. ISBN 978-3-319-94108-0.
  19. Brewer D, Bellamy H, Hoover A, Koempel A, Gaetke L. Nutrition and environmental pollution extension curriculum improved diet-related behaviors and environmental health literacy. *Environ Health Insights* 2019;13:1178630219836992. DOI: 10.1177/1178630219836992. PMID: 30956525; PMCID: PMC6442077.
  20. Hennig B, Ettinger AS, Jandacek RJ, et al. Using nutrition for intervention and prevention against environmental chemical toxicity and associated diseases. *Environ Health Persp* 2007;115(4):493–5. DOI: 10.1289/ehp.9549. Epub 2007 Jan 16. PMID: 17450213; PMCID: PMC1852675.
  21. Ruzzin J. Public health concern behind the exposure to persistent organic pollutants and the risk of metabolic diseases. *BMC Public Health* 2012;12(1):298. DOI: 10.1186/1471-2458-12-298. PMID: 22520265; PMCID: PMC3408385.