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TOPICS IN EDUCATION

# Long-Term Evaluation of a Course on Evidence-Based Public Health in the U.S. and Europe

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The evidence-based public health course equips public health professionals with skills and tools for applying evidence-based frameworks and processes in public health practice. To date, training has included participants from all the 50 U.S. states, 2 U.S. territories, and multiple other countries besides the U.S. This study pooled follow-up efforts (5 surveys, with 723 course participants, 2005–2019) to explore the benefits, application, and barriers to applying the evidence-based public health course content. All analyses were completed in 2020. The most common benefits (reported by >80% of all participants) were identifying ways to apply knowledge in their work, acquiring new knowledge, and becoming a better leader who promotes evidence-based approaches. Participants most frequently applied course content to searching the scientific literature (72.9%) and least frequently to writing grants (42.7%). Lack of funds for continued training (35.3%), not having enough time to implement evidence-based public health approaches (33.8%), and not having coworkers trained in evidence-based public health (33.1%) were common barriers to applying the content from the course. Mean scores were calculated for benefits, application, and barriers to explore subgroup differences. European participants generally reported higher benefits from the course (mean difference=0.12, 95% CI=0.00, 0.23) and higher frequency of application of the course content to their job (mean difference=0.17, 95% CI=0.06, 0.28) than U.S. participants. Participants from later cohorts (2012–2019) reported more overall barriers to applying course content in their work (mean difference=0.15, 95% CI=0.05, 0.24). The evidence-based public health course represents an important strategy for increasing the capacity (individual skills) for evidence-based processes within public health practice. Organization-level methods are also needed to scale up and sustain capacity-building efforts.

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## INTRODUCTION

The changing landscape of public health demands a workforce that is well equipped to apply evidence-based principles and processes. This evidence-based public health (EBPH) approach requires applying the best science, engaging the community in prioritizing their needs, and evaluating each step.[1–4] With myriad paths for individuals to join the public health workforce,[5] it is important that they have a shared understanding of EBPH. Recognizing the diversity of backgrounds among the workforce and the needs for training in evidence-based approaches, an EBPH course was originally developed in 1997 in Missouri for state health department staff.[2] The course continued to evolve and expand its reach to include more U.S. states,

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territories, and countries and has been successfully scaled up through train-the-trainer efforts.[3,6,7] The course has been held internationally 20 times since 2002. From 2002 to 2018, courses hosted in Austria reached people from 13 European and Eastern European countries. Since its inception, >3,000 public health professionals have been trained from all 50 U.S. states, 2 U.S. territories, and >8 countries across 4 continents.

The EBPH course has been extensively evaluated. With in-person presurveys and postsurveys, longer-term follow-up efforts, qualitative interviews with participants, and quasiexperimental efforts that included presurveys and postsurveys with comparison (or control) groups, evaluation has been robust and has shown the course's effectiveness.[6−12] For example, significant pre−post increases were shown in all perceived skills, with the highest increase in understanding economic evaluation.[6] In 2 studies, training participants were compared with control groups and were found to have significant improvements (pre−post) in several competencies for evidence-based decision making (e.g., evaluation, communicating with policymakers).[10,12] Qualitative evaluation highlighted the benefits of the course in providing a common base of knowledge for those with a formal public health training background as well as for those who are newer to the field or have varying educational backgrounds.[11] As is common for sponsored projects with limited funding periods, the various evaluations have been segmented to certain years and participants. Although this allows for real-time evaluation as the course evolves, it is challenging to examine the overall benefits and challenges of training efforts among subgroups of participants with small sample sizes.

Using data from EBPH trainings collected over a 15-year period, the goal of the current evaluation is to describe the benefits, application, and barriers to applying course content across settings and time periods. With pooled data, there is an ability to examine course evaluation data across important subgroups to inform future workforce development efforts.

## METHODS

### Study Sample

The EBPH training, designed as an in-person course founded on adult learning principles,[13] originally consisted of 9 modules (1997−2016) with a 10th module added in 2017. Objectives for each module can be found in Appendix Table 1 (available online), and the EBPH framework can be found in Appendix Figure 1 (available online).

Each module features active learning exercises and integrates programmatic experiences from the teaching faculty and participants. Modules include large group and small group exercises where participants use local data or case examples to apply module concepts. Most iterations of the course are 3.5 days in length and involve 4−6 instructors. Participants are provided all course materials free of charge. More information about the EBPH course can be found at www.evidencebasedpublichealth.org.

Data were pooled from 5 different surveys that collected similar information from participants of the EBPH course over a 15-year span. Some data sets have overlapping course years, but they contain participants from separate courses that may have occurred during the same year. All research received approval by the IRBs at Washington University in St. Louis or Saint Louis University.

Participants (N=626) who completed the EBPH in the U.S. or Europe between 2005 and 2011 were asked to complete a 15-question online course evaluation survey adapted from a previous evaluation tool (Survey 1).[8] Detailed information on this study is published elsewhere.[6] Surveys remained open for 2 months and were sent in 2 waves, with the first in 2009 ($n$=304) and the second in 2012 ($n$=322). All participants were sent a maximum of 3 reminder e-mails, and U.S. participants (2009 wave) received reminder phone calls if such information was provided at course registration. The follow-up surveys were completed by 358 participants (57.2% response), and 312 complete responses are included in this study.

Participants (N=317) who attended a state-sponsored EBPH course between 2011 and 2013 in Colorado, Indiana, Kansas, or Nebraska were asked to complete an online evaluation survey (Survey 2). Complete details are published elsewhere.[7] Participants were invited by e-mail to complete the brief (10-minute) survey and received 2 reminder e-mails, a phone call, and a final reminder e-mail. The survey remained open for 3 months. Of the 283 reachable e-mail addresses, 144 participants completed the survey (50.9% response).

Participants (N=130) of U.S. courses in 1 of 4 states (North Carolina, Ohio, Washington, and Michigan) between April and June of 2013 were invited by e-mail to participate in a follow-up course evaluation survey (Survey 3; a median of 5-minute completion time). The data were part of a larger longitudinal study that is described elsewhere.[10] E-mail and phone call reminders were used, and $20 Amazon gift cards were offered on survey completion. Data were collected approximately 6 months after each course (October 2013−December 2013). From the 124 valid e-mail addresses, 112 course participants completed the survey (90.3% response).

Public health professionals (N=208) who participated in the European EBPH course between 2007 and 2016 were invited by e-mail in 2017 to take a brief (a mean of 15-minute completion time) online course evaluation survey (Survey 4). Complete survey details have been published previously.[9] Participants received 4 reminder e-mails. Of the 188 valid e-mail addresses, 86 course participants completed the survey (45.7% response), and 85 complete responses were included in this study.

As part of an ongoing evaluation of the National Association of Chronic Disease Directors−sponsored EBPH training, participants (N=88) from 3 U.S. courses in 2019 (2 in Missouri and 1 in Connecticut) were asked to complete a brief (a mean of 14-minute completion time) online course evaluation at 6 months after the course (Survey 5; December 2019−February 2020). Participants received 3 reminder e-mails and 1 phone-call reminder where necessary. No incentives were offered. Of the 77 course participants with valid e-mail addresses, 70 completed the survey (91.0% response).

### Measures

By relying on the same questions across the 5 surveys, this study focused on 3 categories of course evaluation assessed in each of the 5 surveys: overall benefit from the course, application of course content and materials, and barriers to applying course content/materials.

Participants rated their agreement (5-point Likert-scale; 1=*strongly disagree*–5=*strongly agree*) with how *The EBPH course helped me*: for 13 items (Figure 1). Participants assessed how frequently they applied course content or materials (*On average since you took the EBPH course, how frequently have you:*) for each of the 6 items (Figure 2). Frequency options were reverse coded so that 1=*seldom/never*, 2=*quarterly*, 3=*monthly*, 4=*weekly*. For Survey 4, data were combined into a fifth category (annually) with quarterly. From 8 barrier items (Figure 1), participants rated agreement (5-point Likert: 1=*strongly disagree*–5=*strongly agree*) with *I have not used the EBPH course content as much as I would like because.*

Data were examined by several participant characteristics: organization type, job position, public health degree, and years in the public health field. Course year was identified either by the participant (Survey 4) or through administrative data (Surveys 1, 2, 3, and 5). Survey 2 was coded as course years 2012–2013 because just 1 course in 1 state occurred in 2011.

### Statistical Analysis

Descriptive statistics were calculated for all participant characteristics across the 5 surveys. For each evaluation outcome (benefits, application, and barriers), scale items were examined for reliability (Cronbach's $\alpha$) using a mean score by averaging Likert scores for each of the evaluation outcomes. The mean benefits score had a possible range of 1–5, with higher scores representing higher reported benefits from the course. One item related to the implementation of the Centers for Disease Control and Prevention –funded programs was removed when calculating the scores for European participants (12 items versus 13 items) because it was only asked of U.S. participants. Mean application scores had a possible range of 1–4, with higher scores representing a higher frequency of use of course concepts. For barrier items, the possible range was 1–5, with higher scores representing greater barriers overall. Investigators used *t*-tests, ANOVA with Tukey's honest significant difference post hoc comparisons, and Pearson correlation to determine significant differences and relationships in subgroup analyses with $\alpha$ level set to $p<0.05$. Data were examined by country, course year, public health degree, and years in public health with the full sample and stratified U.S. and European samples to examine position and organization type. The full sample was used to examine separate barriers across course years. All data management and analyses were completed in 2020 in R, version 4.0.2.

## RESULTS

Among U.S. participants ($n$=583), the largest group was from state health departments (48.2%), followed by the group from local health departments (LHDs) (37.3%) and those from other organizations (community-based organizations, coalitions) (14.5%). For European participants ($n$=140), 49.2% were from other organizations (i.e., community health organizations, voluntary health organizations, medical facilities, universities), 34.8% were from federal/governmental health agencies, and 15.9% were from local/regional health agencies. Across all participants (N=723), the average number of years worked in the public health field was 11.3 (SD=8.2) years with a mean range of 9.5–12.8 years across the 5 surveys (Table 1). The overall proportion of those with a public health degree was 22.1% (ranging from 19.4% to 31.4%).

The most common benefits reported (*agree* or *strongly agree*) from participants were acquiring knowledge about a new subject (85.2%), identifying ways to apply this knowledge in their work (82.9%), becoming a better leader who promoted evidence-based decision making, and making scientifically informed decisions at work (81.4%) (Figure 1). The benefits score, calculated as the mean of 12 benefit scale items ($\alpha$=0.91), had an overall mean of 3.71 (SD=0.62, range=1–5). On average, European participants reported higher benefit from the course than U.S. participants (mean difference=0.12, 95% CI=0.00, 0.23) (Table 2). No significant differences were found in benefit scores across course year groups, across groups with or without public health degrees, or across the length of years working in the public health field. Among U.S. participants, benefit scores were similar across position types. For European participants, benefit scores varied across position type ($F$[3,3.85] =4.09, $p$=0.008). European specialists reported fewer benefits than both executives (mean difference= −0.50, 95% CI= −0.92, −0.09) and program managers (mean difference= −0.45, 95% CI= −0.88, −0.03). There were no differences found in benefit score and organization type for both U.S. and European participants.

The course content was most frequently applied (at least quarterly) when searching the scientific literature (72.9%), when modifying a program or policy (66.2%), when planning a program or policy (65.3%), and when evaluating a program or policy (64.9%) (Figure 2). The frequency score for course application, calculated as the mean of 6 course application items ($\alpha$=0.83), had an overall mean of 1.90 (SD=0.62, range=1–4). On average, European participants reported a higher frequency of course application than the U.S. participants (mean difference=0.17, 95% CI=0.06, 0.28). No significant differences were found in the frequency of application scores across course year, degree, or years in public health groups. No differences were found in application scores or position type among U.S. participants. For European participants, application scores varied significantly across position types ($F$[3,3.70]=3.73, $p$=0.013) and were higher for executives than for both specialists (mean

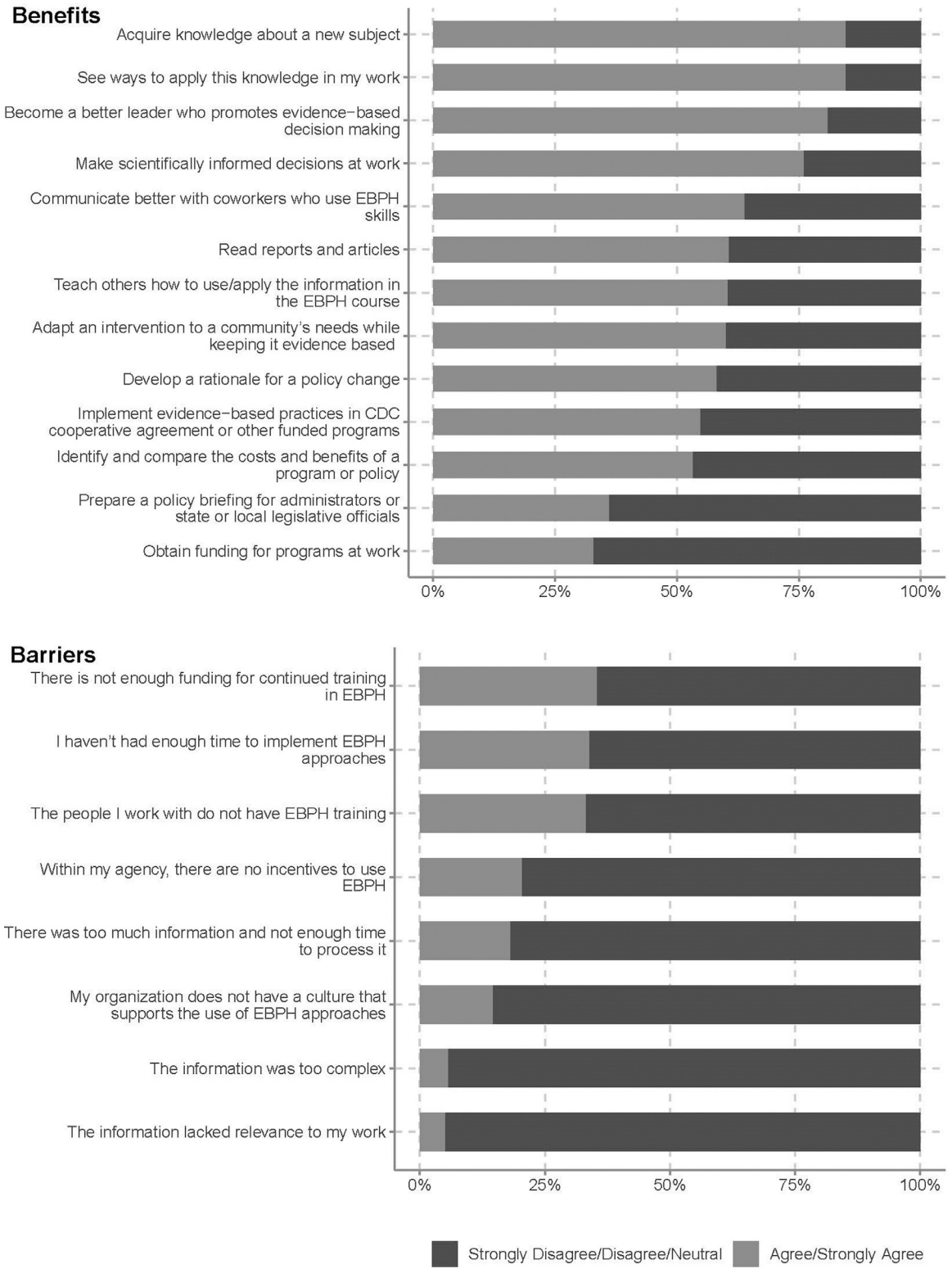


**Figure 1.** Course benefits and barriers reported by participants in 5 evidence-based public health evaluation surveys (N=723).
CDC, Centers for Disease Control and Prevention; EBPH, evidence-based public health.

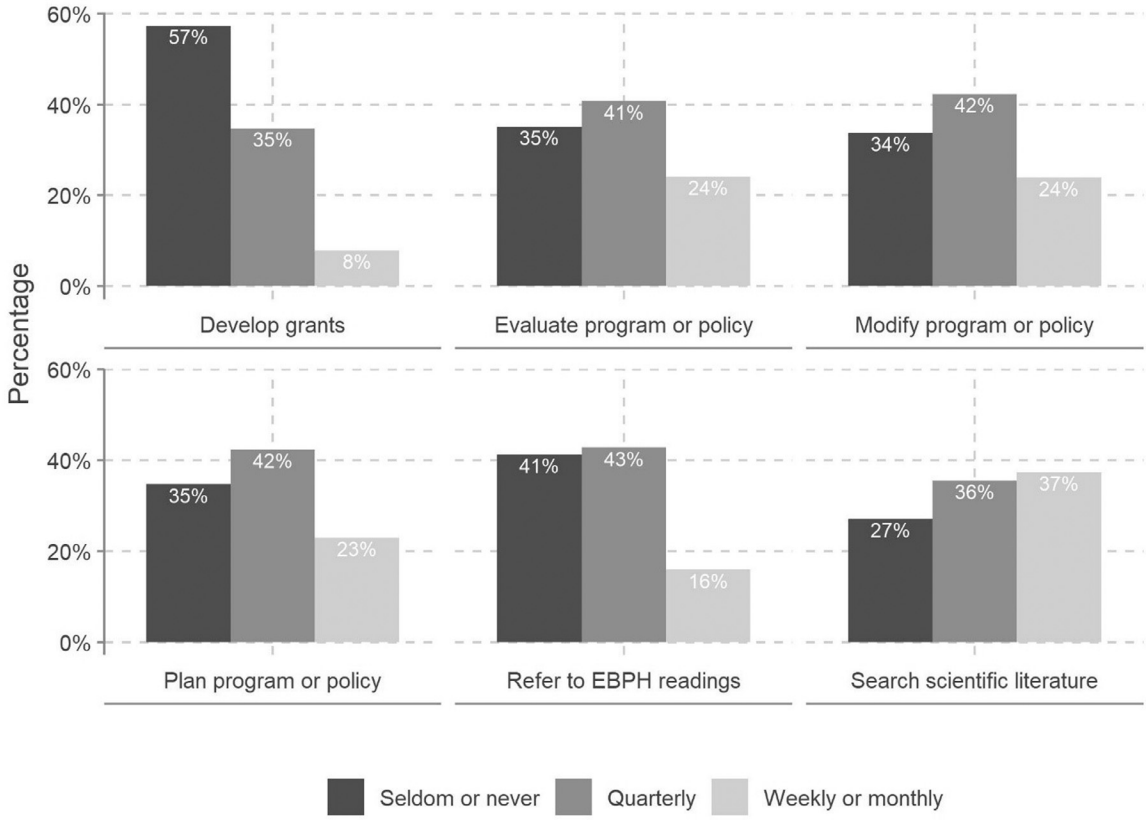


**Figure 2.** Frequency of participant application of concepts and content from the evidence-based public health course (N=723).
EBPH, evidence-based public health.

difference=0.46, 95% CI=0.03, 0.88) and other positions (mean difference=0.38, 95% CI=0.03, 0.74). For U.S. participants, application varied across organizations ($F$ [2,4.36]=5.89, $p$=0.003). State and LHD staff reported less application than those from other organizations (mean difference= −0.20, 95% CI= −0.38, −0.02 and mean difference= −0.27, 95% CI= −0.46, −0.09, respectively). For European participants, application scores were found to vary significantly across organization types ($F$[2,2.13]=3.17, $p$=0.045), although no significant post hoc comparisons were found.

The most common barriers reported (*agree* or *strongly agree*) to applying course content were lack of funding for continued training in EBPH (35.3%), not enough time to implement EBPH approaches (33.8%), and lack of other colleagues with EBPH training (33.1%) (Figure 1). The barriers score, calculated as the mean of 8 barrier scale items ($\alpha$=0.79), had an overall mean of 2.49 (SD=0.65, range=1−5). No significant differences in barrier scores were found between U.S. and European participants. Participants from later cohorts (2012−2019) reported significantly higher barrier scores than those from earlier cohorts (2005−2011) (mean difference=0.15, 95% CI=0.05, 0.24). The more frequently reported barriers over time included not enough time and too much information to process (Appendix Table 2, available online). No significant differences were found in barrier scores among groups with or without public health degrees or length of years working in the public health field. No significant differences were found in barrier scores or position type among both U.S. and European participants. For U.S. participants, barrier scores were significantly different among organization types ($F$[2,5.34]=6.28, $p$=0.002), with LHD staff reporting greater barriers than both state health staff (mean difference=0.18, 95% CI=0.04, 0.33) and other organizations (mean difference=0.25, 95% CI=0.04, 0.45). Barrier scores did not differ significantly among organization types for European participants.

## DISCUSSION

Participants reported many benefits from the EBPH course over the 15-year evaluation period. Learning a new subject and identifying ways to apply the information were the commonly reported benefits, which is

**Table 1.** Participant Characteristics Across the 5 Evidence-Based Public Health Course Evaluation Surveys

| Characteristics | Survey 1 (*n*=312), *n* (%) | Survey 2 (*n*=144), *n* (%) | Survey 3 (*n*=112), *n* (%) | Survey 4 (*n*=85), *n* (%) | Survey 5 (*n*=70), *n* (%) | Total (N=723), *n* (%) |
|---|---|---|---|---|---|---|
| Course location | | | | | | |
| U.S. | 257 (82.4) | 144 (100.0) | 112 (100.0) | — | 70 (100.0) | 583 (80.6) |
| Europe | 55 (17.6) | — | — | 85 (100.0) | — | 140 (19.4) |
| Position[a] | | | | | | |
| Executive | 29 (9.3) | 14 (9.7) | 25 (22.3) | 17 (20.0) | 6 (8.6) | 91 (12.6) |
| Manager | 134 (42.9) | 49 (34.0) | 57 (50.9) | 18 (21.2) | 35 (50.0) | 293 (40.5) |
| Specialist | 76 (24.4) | 51 (35.4) | 18 (16.1) | 13 (15.3) | 19 (27.1) | 177 (24.5) |
| Other[b] | 47 (15.1) | 30 (20.8) | 12 (10.7) | 36 (42.4) | 9 (12.9) | 134 (18.5) |
| Organization | | | | | | |
| State health department (U.S.) | 173 (60.5) | 38 (26.4) | 10 (8.9) | — | 49 (71.0) | 270 (39.0) |
| Local health department (U.S.) | 30 (10.5) | 80 (55.6) | 96 (85.7) | — | 3 (4.3) | 209 (30.2) |
| Other (U.S.)[c] | 35 (12.2) | 26 (18.1) | 3 (2.7) | — | 17 (24.6) | 81 (11.7) |
| Local/regional health agencies (Europe) | 6 (2.1) | — | — | 15 (17.6) | — | 21 (3.0) |
| Federal/governmental health agencies (Europe) | 18 (6.3) | — | — | 28 (32.9) | — | 46 (6.7) |
| Other (Europe)[c] | 24 (8.4) | — | — | 41 (48.2) | — | 65 (9.4) |
| Public health degree | 62 (19.9) | 28 (19.4) | 25 (22.3) | 23 (27.1) | 22 (31.4) | 160 (22.1) |
| Years in public health (mean±SD) | 11.7±8.3 | 9.5±7.2 | 12.8±8.0 | 10.9±8.6 | 10.7±9.2 | 11.3±8.2 |
| Course year | | | | | | |
| 2005–2011 | 312 (100.0) | 0 (0.0) | 0 (0.0) | 33 (38.8) | 0 (0.0) | 345 (47.7) |
| 2012–2019 | 0 (0.0) | 144 (100.0) | 112 (100.0) | 52 (61.2) | 70 (100.0) | 378 (52.3) |

[a]Examples of executive positions include health director/officer/commissioner. Manager positions include managers of divisions or programs. Examples of specialist positions include statistician and epidemiologist.
[b]Examples of other positions include medical practitioner/clinician and academic researcher.
[c]Examples of other organizations include community health organizations, voluntary health organizations, medical facilities, and universities.

encouraging given that only 14% of U.S. health department staff at all levels have formal public health training.[5] The current sample showed that between 19% and 31% of respondents held public health degrees. No differences were shown in overall benefits from the course among those newer to the public health field or those with no formal training versus seasoned public health professionals with formal training, suggesting relevance across experience.

The most frequently applied EBPH concept is searching the scientific literature. Using online databases for searching for the latest evidence crosses several of the course modules, beginning with the planning phase of a program or policy. The current results suggest that for some organizations, course concepts may be less frequently applied overall, which may be due in part to the diversity of public health programming functions performed by different organizations. For the European participants, local or more regional-based public health organizations reported higher application scores, whereas in the U.S., LHDs reported less frequent application of course concepts. U.S. LHDs often cover smaller jurisdictions with less funding and rely on state resources for programming functions.[14,15] Participants from U.S. LHDs also reported higher barriers overall than those from state health departments and other organizations. Nonetheless, U.S. LHD participants rated overall benefits similar to those rated by participants from other organizations.

The smaller proportions of participants who reported barriers to applying course content (compared with the proportion reporting benefits) is encouraging. However, one of the most common barriers reported by more than one third of respondents was not having enough funding for continued training. Previous studies have established the importance of continued training in EBPH to maintain evidence-based processes within health departments.[16] The challenge of keeping trained employees with limited funds and inevitable turnover emphasizes another commonly reported barrier of having too few coworkers trained in EBPH.[17]

**Table 2.** Participant-Rated Benefits, Application, and Barriers to the Application of EBPH Course Content and Concepts

| Measures | Benefits[a] (range=1–5), mean±SD or Pearson R, *n* | Application[b] (range=1–4) | Barriers[c] (range=1–5) |
|---|---|---|---|
| Full sample (N=723) | | | |
| Country (mean ±SD) | | | |
| U.S. | **3.68±0.62**[d] | **1.86±0.61** | 2.48±0.66 |
| Europe | **3.80±0.58** | **2.03±0.61** | 2.56±0.61 |
| Course year (mean ±SD) | | | |
| 2005–2011 | 3.67±0.64 | 1.94±0.64 | **2.41±0.67** |
| 2012–2019 | 3.74±0.59 | 1.85±0.59 | **2.56±0.62** |
| Public health degree (mean±SD) | | | |
| Yes | 3.71±0.61 | 1.96±0.64 | 2.44±0.67 |
| No | 3.70±0.62 | 1.88±0.61 | 2.51±0.64 |
| Years in public health (Pearson R correlation) | 0.06 | 0.03 | −0.04 |
| European sample (*n*=140) | | | |
| Position[d] (mean ±SD) | | | |
| Executive | **3.99±0.44**[d] | **2.30±0.61**[d,e] | 2.45±0.64 |
| Manager | **3.94±0.50**[e] | **2.13±0.67** | 2.46±0.69 |
| Specialist | **3.49±0.71**[d,e] | **1.84±0.51**[d] | 2.70±0.57 |
| Other position[f] | **3.77±0.57** | **1.92±0.53**[d] | 2.63±0.56 |
| Organization type (mean ±SD) | | | |
| Federal/governmental | 3.85±0.56 | **2.08±0.56** | 2.48±0.56 |
| Local/regional/provincial/city | 3.84±0.56 | **2.25±0.52** | 2.62±0.52 |
| Other organization[g] | 3.72±0.62 | **1.91±0.61** | 2.62±0.67 |
| U.S. sample (*n*=583) | | | |
| Position[f] (mean ±SD) | | | |
| Executive | 3.85±0.45 | 1.99±0.62 | 2.46±0.56 |
| Manager | 3.68±0.64 | 1.86±0.60 | 2.48±0.67 |
| Specialist | 3.62±0.60 | 1.84±0.61 | 2.51±0.65 |
| Other position[g] | 3.59±0.71 | 1.80±0.67 | 2.38±0.72 |
| Organization type (mean ±SD) | | | |
| State health department | 3.64±0.66 | **1.85±0.63**[d] | **2.42±0.63**[d] |
| Local health department | 3.65±0.61 | **1.78±0.55**[e] | **2.60±0.64**[d,e] |
| Other organization[h] | 3.80±0.55 | **2.05±0.66**[d,e] | **2.36±0.73**[e] |

*Note:* Boldface indicates statistical significance ($p<0.05$) from *t*-test or ANOVA findings.
[a]Mean (SD) score of 13 Likert-scale (1=strongly disagree to 5=strongly agree) items on benefits of the EBPH course.
[b]Mean (SD) score of 6 items measuring the frequency (1=seldom/never, 2=quarterly, 3=monthly, 4=weekly) of application of EBPH course content.
[c]Mean (SD) score of 8 Likert-scale (1=strongly disagree to 5=strongly agree) items on barriers to applying EBPH course content.
[d,e]Significant post hoc ANOVA comparisons.
[f]Examples of executive positions include health director/officer/commissioner. Manager positions include managers of divisions or programs. Examples of specialist positions include statistician and epidemiologist.
[g]Examples of other positions include medical practitioner/clinician and academic researcher.
[h]Examples of other organizations include community health organizations, voluntary health organizations, and universities.
EBPH, evidence-based public health; ANOVA, analysis of variance.

In general, later cohorts reported more barriers to applying the course concepts in their work. In the U.S., the size of the public health workforce and its funding has decreased over the past several years.[18–20] For LHDs, there was an estimated 22% decrease in workforce size from 2008 to 2016 after the recession.[14,15] With fewer workers to do the work, less time may be available for public health professionals to integrate evidence-based processes into their usual work flow, a barrier commonly reported in this study and elsewhere.[8,21] Even finding the time to attend an in-person training over consecutive days can be challenging.

In light of barriers identified in this evaluation and in related literature,[3,22] there are several lessons to inform future workforce capacity-building efforts. First, to overcome the cost barrier, virtual options can more efficiently use resources and increase accessibility to participants.[7] With the growth in the science of online education,[23] virtual versions of the training will be increasingly available. In recent years, virtual and hybrid

models of the EBPH training have been developed and have shown training effects similar to those of more traditional, in-person formats.[7,22,24] For example, in June 2020, public health partners in Connecticut adapted the in-person EBPH course to an online version offered weekly in 2-hour blocks over 10 weeks. A second major barrier is the lack of time to apply EBPH concepts. To address time constraints, organizational leaders can prioritize workforce development.[25,26] In doing so, they can set aside protected time for staff to re-engage with content informally (e.g., searching the literature) and formally (e.g., monthly learning sessions with staff members).[27] Third, the lack of trained colleagues is a barrier. Leaders need to continually stress the importance of life-long learning and the need to maintain a critical mass and a social network in support of applying EBPH concepts.[26,28] Finally, the barriers and context for applying EBPH concepts differ in every public health agency. To further the application of key principles and allow tailoring to local priorities,[29] active brainstorming sessions are conducted at the end of each EBPH training to explore ways to tailor and apply evidence-based processes and embed them within participants' organizational units.

### Limitations

The main study limitations are a post-test–only study design, self-report measures, possible recall bias, and response bias (with a response rate ranging from 46% to 91%). In the case of application of EBPH principles, self-report measures may reflect social influences to report higher use (social desirability bias). In addition, using 5 different sources of data could limit understanding given the differing, although similar, survey methodology (e.g., the differing time between survey administration and course completion). Despite these limitations, this study provides needed information on the value of the EBPH course.

## CONCLUSIONS

To the authors' knowledge, this is the first long-term evaluation of EBPH training—it provides an overview of the benefits, application, and barriers to the application of the EBPH course concepts to public health practice. The EBPH course represents 1 important strategy for increasing the capacity (individual skills) for evidence-based processes within public health practice. Training programs such as the EBPH course cannot be treated as one-time events—they should be funded, integrated into ongoing workforce development efforts, and tailored to local priorities. In addition, organization-level approaches (e.g., supportive climate and culture, leadership training, funding for training, staff to coordinate courses) are needed to scale up and sustain capacity-building efforts.[22,30,31]

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Author contributions are as follows: RCB and RRJ conceptualized and designed the study, RRJ conducted data management and analyses and drafted the initial manuscript, and all the authors participated in the manuscript development and revisions. All authors read, edited, and approved the final manuscript.

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## SUPPLEMENTAL MATERIAL

Supplemental materials associated with this article can be found in the online version at https://doi.org/10.1016/j.amepre.2021.03.003.

## REFERENCES

1. Kohatsu ND, Robinson JG, Torner JC. Evidence-based public health: an evolving concept. *Am J Prev Med.* 2004;27(5):417–421. https://doi.org/10.1016/j.amepre.2004.07.019.
2. Brownson RC, Gurney JG, Land GH. Evidence-based decision making in public health. *J Public Health Manag Pract.* 1999;5(5):86–97. https://doi.org/10.1097/00124784-199909000-00012.
3. Brownson RC, Fielding JE, Green LW. Building capacity for evidence-based public health: reconciling the pulls of practice and the push of research. *Annu Rev Public Health.* 2018;39:27–53. https://doi.org/10.1146/annurev-publhealth-040617-014746.
4. Brownson RC, Baker EA, Deshpande AD, Gillespie KN. *Evidence-Based Public Health.* 3rd ed. Oxford, UK: Oxford University Press, 2018.
5. Sellers K, Leider JP, Gould E, et al. The state of the U.S. governmental public health workforce, 2014-2017. *Am J Public Health.* 2019;109(5):674–680. https://doi.org/10.2105/AJPH.2019.305011.
6. Gibbert WS, Keating SM, Jacobs JA, et al. Training the workforce in evidence-based public health: an evaluation of impact among U.S. and international practitioners. *Prev Chronic Dis.* 2013;10:E148. https://doi.org/10.5888/pcd10.130120.
7. Yarber L, Brownson CA, Jacob RR, et al. Evaluating a train-the-trainer approach for improving capacity for evidence-based decision making in public health. *BMC Health Serv Res.* 2015;15(1):547. https://doi.org/10.1186/s12913-015-1224-2.
8. Dreisinger M, Leet TL, Baker EA, Gillespie KN, Haas B, Brownson RC. Improving the public health workforce: evaluation of a training course to enhance evidence-based decision making. *J Public Health*

*Manag Pract.* 2008;14(2):138–143. https://doi.org/10.1097/01.PHH.0000311891.73078.50.
9. Serrano N, Diem G, Grabauskas V, et al. Building the capacity - examining the impact of evidence-based public health trainings in Europe: a mixed methods approach. *Glob Health Promot.* 2020;27(2):45–53. https://doi.org/10.1177/1757975918811102.
10. Jacobs JA, Duggan K, Erwin P, et al. Capacity building for evidence-based decision making in local health departments: scaling up an effective training approach. *Implement Sci.* 2014;9:124. https://doi.org/10.1186/s13012-014-0124-x.
11. Baker EA, Brownson RC, Dreisinger M, McIntosh LD, Karamehic-Muratovic A. Examining the role of training in evidence-based public health: a qualitative study. *Health Promot Pract.* 2009;10(3):342–348. https://doi.org/10.1177/1524839909336649.
12. Brownson RC, Allen P, Jacob RR, et al. Controlling chronic diseases through evidence-based decision making: a group-randomized trial. *Prev Chronic Dis.* 2017;14:E121. https://doi.org/10.5888/pcd14.170326.
13. Bryan RL, Kreuter MW, Brownson RC. Integrating adult learning principles into training for public health practice. *Health Promot Pract.* 2009;10(4):557–563. https://doi.org/10.1177/1524839907308117.
14. Willard R, Shah GH, Leep C, Ku L. Impact of the 2008–2010 economic recession on local health departments. *J Public Health Manag Pract.* 2012;18(2):106–114. https://doi.org/10.1097/PHH.0b013e3182461cf2.
15. Robin N, Leep CJ. NACCHO's National Profile of Local Health Departments Study: looking at trends in local public health departments. *J Public Health Manag Pract.* 2017;23(2):198–201. https://doi.org/10.1097/PHH.0000000000000536.
16. Allen P, Jacob RR, Lakshman M, Best LA, Bass K, Brownson RC. Lessons learned in promoting evidence-based public health: perspectives from managers in state public health departments. *J Community Health.* 2018;43(5):856–863. https://doi.org/10.1007/s10900-018-0494-0.
17. Bogaert K, Castrucci BC, Gould E, et al. The Public Health Workforce Interests and Needs Survey (PH WINS 2017): an expanded perspective on the state health agency workforce. *J Public Health Manag Pract.* 2019;25(suppl 2):S16–S25. https://doi.org/10.1097/PHH.0000000000000932.
18. Beck AJ, Boulton ML. Trends and characteristics of the state and local public health workforce, 2010-2013. *Am J Public Health.* 2015;105(suppl 2):S303–S310. https://doi.org/10.2105/AJPH.2014.302353.
19. Association of State and Territorial Health Officials. ASTHO profile of state and territorial public health, 4. Arlington, VA: Association of State and Territorial Health Officials. https://www.astho.org/Profile/Volume-Four/2016-ASTHO-Profile-of-State-and-Territorial-Public-Health/. Published 2017. Accessed March 22, 2021.
20. National Association of County & City Health Officials. 2016 National profile of local health departments. Washington, DC: National Association of County & City Health Officials. https://www.naccho.org/uploads/downloadable-resources/ProfileReport_Aug2017_final.pdf. Published August 2017. Accessed March 22, 2021.
21. Harding KE, Porter J, Horne-Thompson A, Donley E, Taylor NF. Not enough time or a low priority? Barriers to evidence-based practice for allied health clinicians. *J Contin Educ Health Prof.* 2014;34(4):224–231. https://doi.org/10.1002/chp.21255.
22. Brownson CA, Allen P, Yang SC, Bass K, Brownson RC. Scaling up evidence-based public health training. *Prev Chronic Dis.* 2018;15:E145. https://doi.org/10.5888/pcd15.180315.
23. Richmond H, Copsey B, Hall AM, Davies D, Lamb SE. A systematic review and meta-analysis of online versus alternative methods for training licensed health care professionals to deliver clinical interventions. *BMC Med Educ.* 2017;17(1):227. https://doi.org/10.1186/s12909-017-1047-4.
24. Jacob RR, Duggan K, Allen P, et al. Preparing public health professionals to make evidence-based decisions: a comparison of training delivery methods in the United States. *Front Public Health.* 2018;6:257. https://doi.org/10.3389/fpubh.2018.00257.
25. Dean HD, Myles RL, Spears-Jones C, Bishop-Cline A, Fenton KA. A strategic approach to public health workforce development and capacity building. *Am J Prev Med.* 2014;47(5 suppl 3):S288–S296. https://doi.org/10.1016/j.amepre.2014.07.016.
26. Brownson RC, Allen P, Duggan K, Stamatakis KA, Erwin PC. Fostering more-effective public health by identifying administrative evidence-based practices: a review of the literature. *Am J Prev Med.* 2012;43(3):309–319. https://doi.org/10.1016/j.amepre.2012.06.006.
27. Archer A, Berry I, Bajwa U, Kalda R, Di Ruggiero E. Preferred modalities for delivering continuing education to the public health workforce: a scoping review. *Health Promot Chronic Dis Prev Can.* 2020;40(4):116–125. https://doi.org/10.24095/hpcdp.40.4.03.
28. Aarons GA, Hurlburt M, Horwitz SM. Advancing a conceptual model of evidence-based practice implementation in public service sectors. *Adm Policy Ment Health.* 2011;38(1):4–23. https://doi.org/10.1007/s10488-010-0327-7.
29. McKeever J, Leider JP, Alford AA, Evans D. Regional training needs assessment: a first look at high-priority training needs across the United States by region. *J Public Health Manag Pract.* 2019;25(suppl 2):S166–S176. https://doi.org/10.1097/PHH.0000000000000946.
30. Mazzucca S, Parks RG, Tabak RG, et al. Assessing organizational supports for evidence-based decision making in local public health departments in the United States: development and psychometric properties of a new measure. *J Public Health Manag Pract.* 2019;25(5):454–463. https://doi.org/10.1097/PHH.0000000000000952.
31. Glynn MK, Jenkins ML Jr, Ramsey C, Simone PM. Public health workforce 3.0: recent progress and what's on the horizon to achieve the 21st-century workforce. *J Public Health Manag Pract.* 2019;25(suppl 2):S6–S9. https://doi.org/10.1097/PHH.0000000000000971.