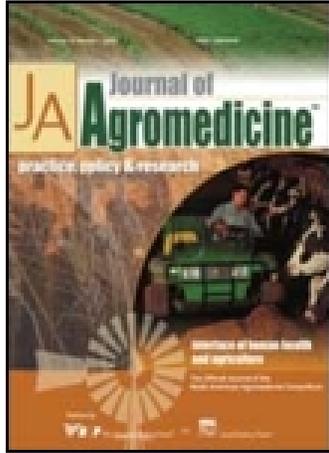


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Josie M. Rudolphi^a & Kelley J. Donham^a

^a Department of Occupational and Environmental Health, University of Iowa, Iowa City, Iowa, USA

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Increasing the Number of Trained Health and Safety Professionals in Agricultural Medicine: Evaluation of the “Building Capacity” Program, 2007–2013

Josie M. Rudolphi and Kelley J. Donham

Department of Occupational and Environmental Health, University of Iowa,
Iowa City, Iowa, USA

ABSTRACT. The University of Iowa began training health care professionals to care for farmers’ occupational health needs since 1974. In order to geographically expand this training to practicing health and safety professionals, the “Building Capacity: A National Resource of Agricultural Medicine Professionals” program was developed and launched in 2006. The model began in 1987 as a program of Iowa’s Center for Agricultural Safety and Health. In 2006, with funding from the National Institute for Occupational Safety and Health (NIOSH), Great Plains Center for Agricultural Health (GPCAH), the program was expanded beyond the Iowa borders. The principal component of the program, the 40-hour course, *Agricultural Medicine: Occupational and Environmental Health for Rural Health Professionals—the Core Course* (AMCC) is now being offered to health and safety professionals in nine states in the United States, in Australia, and a modified version presented in Turkey. An initial paper evaluated the first phase of the program, years 2007–2010. This paper compares the first phase (2007–2010) with the second phase (2011–2013), which has involved over 500 health and safety professionals. This paper also describes evaluation of the course and changes resulting from the evaluation. Finally, this paper describes best practices for operating this program and makes recommendations for future courses, as well as other trainings within the field.

KEYWORDS. Agriculture, health, medicine, occupational, safety

BACKGROUND

The deficiency in the number of trained professionals in agricultural safety and health relative to the need has been discussed.^{1,2} Since the mid-1970s, the University of Iowa has been developing educational programming in occupational and environmental health for graduate and health sciences students with a focus on agriculture.³ Initial programs included introductory lectures in agricultural medicine, a graduate-level course for nursing, medical,

industrial hygiene, and environmental health student, a rotation in agricultural medicine for medical students, and research projects in agricultural medicine for medical students.⁴

In 1987, the Iowa legislature recognized the need for providing specialized occupational health services for the farm community.¹ The state passed funding to develop a pilot program to develop two model clinics specializing in providing occupational health services to farm communities. In 1990, the state legislature created Iowa’s Center for Agricultural

Address correspondence to: Josie M. Rudolphi, Department of Occupational and Environmental Health, University of Iowa, 100 CPHB, S312, Iowa City, IA 52242, USA (E-mail: Josie-rudolphi@uiowa.edu).

Safety and Health (I-CASH) and the clinic pilot program became a regular program of I-CASH. Dr. Kelley Donham, I-CASH director, and I-CASH staff recognized that specialized training was necessary for providers who staffed these clinics. Therefore, the existing 3-hour graduate course in rural health and agricultural medicine was modified into a 40-hour workshop held annually at the University of Iowa. This training program helped the pilot clinic program develop to a network of 22 agricultural occupational health and safety clinics. (Note the clinic program transcended from an I-CASH program to the national nonprofit organization the AgriSafe Network in 2003.) These clinics provided agricultural occupational services to rural communities, meeting a prior unmet need.⁴ Between 1987 and 2006, the University of Iowa (I-CASH and the Great Plains Center for Agricultural Health [GPCAH]) had trained 300 students and 160 had received a certificate by virtue of passing a comprehensive examination over the material.⁴

Even with the advent of this training program, a 2002 report indicated that there had been little improvement on a national basis in the number of professionals trained in agricultural safety and health.⁵ Rural health care providers can influence farm workers' health but have limited knowledge on agricultural work and occupational and environmental risks.⁶ For this reason, Simmons called for rural medicine to become its own specialty, with residency and certification requirements.⁷ As a result, with funding from the National Institute for Occupational Safety and Health (NIOSH) through the GPCAH,⁴ the University of Iowa expanded their existing course beyond Iowa's borders. The course, *Agricultural Medicine: Occupational and Environmental Health for Rural Health Professionals—the Core Course* (AMCC), as part of a the "Building Capacity: A National Resource of Agricultural Medicine Professionals" program, was offered in other midwestern states with the overarching goal of developing and delivering effective, sustainable, and accessible agricultural medicine training in multiple regions of the United States.

The Building Capacity program and the course *Agricultural Medicine: Occupational*

and Environmental Health for Rural Health Professionals—the Core Course (AMCC) fill an important gap in agricultural safety and health education. Currently, only a few universities within the United States offer training or courses on topics of agricultural safety and health. A few land-grant intuitions include a course in agricultural safety as part of their agricultural engineering studies, and even fewer health sciences universities offer training in agricultural health. *Agricultural Medicine: Occupational and Environmental Health for Rural Health Professionals—the Core Course* (AMCC) is the only comprehensive agricultural health and safety training program available.⁸

PROGRAM EVALUATION

The first phase of the Building Capacity program ran from 2007 to 2010. The second grant period began in 2011 (these phases were based on the different NIOSH-funded grants for the periods).

One objective of the Building Capacity program is to conduct ongoing evaluation and meta-evaluation of the program and its specific aims. The program has identified six program-specific aims, outlined in the initial grant application, each with specific process and outcomes measures. The results of evaluation of the aim "offer AMCC to health care and occupational health and safety professionals in the upper Midwest on an annual basis" are outlined below.

The following data summarize both process measures and measurable outcomes for the aim comparing the first phase of the program (2007–2010) with what data have been collected for the second phase (2011–present). The overall goal of the evaluation is to ensure consistency among AMCC sites, determine how modifications to the course have been received, and develop recommendations for content or delivery of the course.

Process Measures

The course was revised and improved as needed based on feedback and evaluations from students. Before the second phase of the

program began, a consensus process, which consisted of an international committee of safety and health professionals, reviewed and updated the course curriculum and expanded the intended audience from the Midwest to the whole United States as well as adaptations for an international audience. Since then, the type of course offerings have changed, locations of courses have been added, and educational methods have advanced.

Measurable Outcomes

As part of the evaluation plan, the University of Iowa collected student background information, conducted course pretests and posttests, and collected student course evaluations (where applicable) and student examination scores for all locations. Student totals were tabulated, pre- and posttest scores were compared, mean examination scores were compared across sites, and course evaluations were examined to determine program strengths and deficiencies. Additionally, 6 months after the training, students completed an online follow-up survey. The 6-month follow-up survey determined students' professional attitudinal and behavioral changes since taking the course, implementation of course principles, and topics of future interest within agricultural medicine.

The six specific measurable outcomes for one of the program's aims are listed and evaluated below.

1. Dates and locations of AMCC delivered in the three new regions.
2. Number of trainees, state of residence, and professional specialty of those completing AMCC.
3. Number of trainees who pass the examination.
4. Percent of trainees indicating that their ability to anticipate, diagnose, treat, and/or prevent agricultural occupational illnesses and injuries improved as a result of taking AMCC and the percent of trainees indicating that they feel confident when recommending appropriate personal protective equipment (respirators, hearing

protection, etc.) to exposed agricultural producers.

5. Assessment of retained knowledge and changes in practice 6 months following completion of AMCC.
6. A list of best practices for presenting the AMCC based on recommendations from our program evaluation and recommended revisions.

1. Dates and locations of AMCC delivered in the three new regions.

During the first phase of the Building Capacity program, 2007–2010, 10 AMCC courses were held in five states: Iowa, Illinois, Vermont, North Carolina, and Wisconsin/Minnesota.

Between 2011 and 2013, an additional 13 AMCC courses were offered. In addition to the five states that hosted courses between 2007 and 2011, Nebraska and North Dakota also offered the course (Figure 1). Looking forward, Texas and Alabama are scheduled to host the course respectively in 2014 and 2015.

2. Number of trainees, state of residence, and professional specialty of those completing AMCC.

The first AMCC offered in 2007 attracted 34 participants. Throughout the first phase of the Building Capacity program, 2007–2010, 300 students attended 1 of the 10 AMCC courses offered. Over the course of the next 3e years (2011, 2012, and 2013), another 266 students participated in the course. The average number of students/year attending an AMCC was 75 during the first phase and 92 during the second phase (Figure 2).

The course has been aimed at a multiprofessional health and safety audience. Major occupational areas represented at AMCC trainings include University of Iowa students, nurses, medical doctors, and veterinarians. Since 2011, one of the largest growth areas has been in graduate students and veterinarian. Both Iowa and Nebraska offer this course as a 3-hour graduate credit course for students in MS and PhD programs (Table 1).

FIGURE 1. Origin of AMCC students by country and state.

Number and Origin of Building Capacity Training Participants
2007-2013

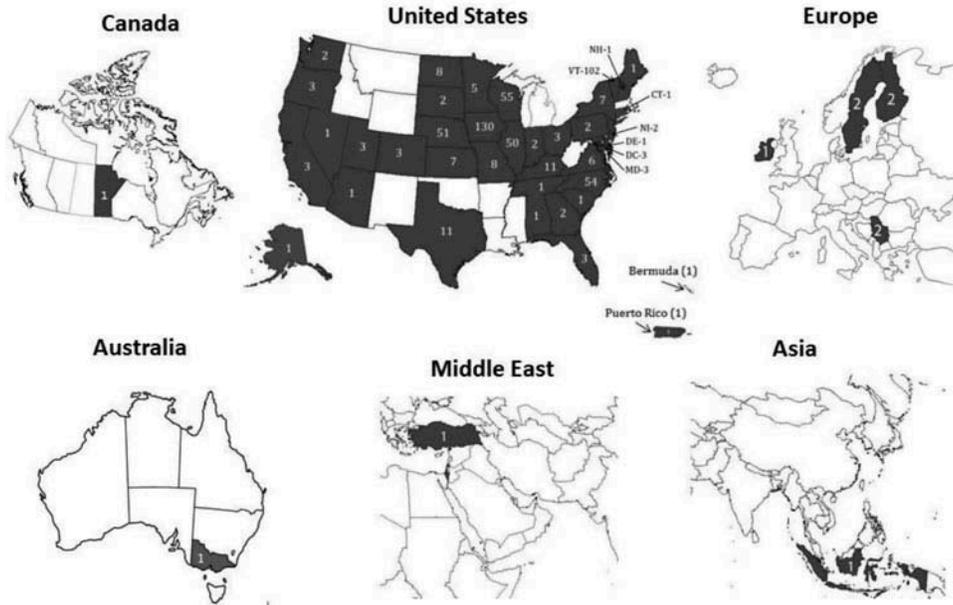
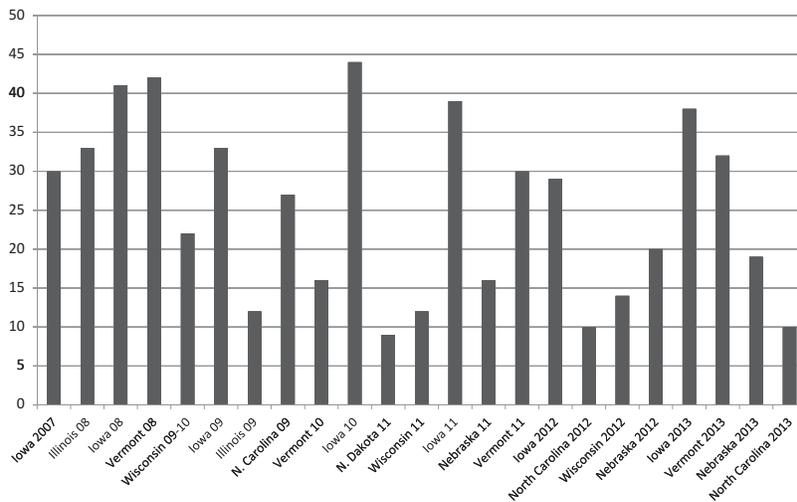


FIGURE 2. Number of participants in AMCC by year and location.



3. Number of trainees who pass the examination.

Upon completing both sessions of AMCC, students are tested over the material presented in each session online. Two separate tests are

given, each focusing on one of the two sessions and the material covered.

The examinations are based on material as presented in the text for the course (*Agricultural Medicine: Occupational and Environmental Health for the Health Professions*). The

TABLE 1. Major Occupational Areas Represented by AMCC Students, by Percentage

Occupational area	Percent of students
UI graduate students	28%
Medical doctor	26%
Registered nurse/Bachelor's degree in nursing	14%
Doctor of veterinary medicine	10%
Physician assistant	7%
PhD	4%
Extension/Outreach	4%
Nurse practitioner	3%
Family nurse practitioner	2%
Licensed practicing nurse	1%

examination is an objective online examination. Students must attain at least a 70% to pass the examination and receive the certificate (Table 2). The questions are selected randomly from a

bank of 300 questions. Each examination is different. Students taking the course for graduate credit must take the online examinations within 30 days of completing the course. In order to become an AgriSafe provider,¹ candidates must take the examination with a proctor.

4. Percent of trainees indicating that their ability to anticipate, diagnose, treat, or prevent agricultural occupational illnesses and injuries improved as a result of taking AMCC and the percent of trainees indicating that they feel confident when recommending appropriate personal protective equipment (respirators, hearing protection, etc.) to exposed agricultural producers.

In a 6-month follow-up survey, past students of AMCC were surveyed about their confidence

TABLE 2. Mean Examination Scores of AMCC Students by Location and Session

Site	No. of students	Examination 1 mean	Examination 2 mean
Phase 1: 2007–2010			
Iowa 2007	30	88.19	90.48
Illinois 2008	33	81.58	90.48
Iowa 2008	41	87.53	91.26
Vermont 2008	42	78.81	83.46
Wisconsin 2009–2010			
Iowa 2009	33	79.35	82.92
Illinois 2009	12	84.36	85.89
North Carolina 2009	27	84.96	NA
Vermont 2010	16	84.78	81.06
Iowa 2010	44	78.47	84.54
Total	300	83.95	88.07
Phase 2: 2011–present			
North Dakota 2011	9	82.6	86.0
Wisconsin 2011	12	85.8	91.7
Iowa 2011	39	82.5	85.7
Nebraska 2011	16	82.0	87.1
Vermont 2011	30	87.5	82.5
North Carolina 2012	10	81.0	87.0
Wisconsin 2012	14	80	85.0
Iowa 2012	29	80	85.0
Nebraska 2012	20	87.9	88.9
North Carolina 2013	10	84.9	84.2
Vermont 2013	19	83.0	88.8
Iowa 2013	38	82.0	85.0
Nebraska 2013	19	86	84.3
Total	265	83.0	84.9
Building Capacity phase			
Phase I (2007–2011)	300	83.7	86.3
Phase II (2011–present)	265	82.6	86.0

TABLE 3. AMCC Students' Responses to 6-Month Follow-up Survey Statements by Statement, Frequency, and Percent

6-Month follow-up survey statement	Level of agreement with survey statement	2007–2010 Respondents (%)	2011–2012 Respondents (%)
The information received during the course has helped me address the occupational and environmental hazards of the agricultural community in my region. (<i>N</i> = 66, <i>N</i> = 103)	Strongly agree	19 (29%)	23 (23%)
	Agree	32 (48%)	44 (43%)
	Neutral	7 (11%)	11 (11%)
	Disagree	0 (0.0%)	2 (2.0%)
	Strongly disagree	1 (1.5%)	2 (2.0%)
My ability to anticipate, diagnoses, treat, and/or prevent agricultural occupational illnesses and injuries has improved as a result of taking this course. (<i>N</i> = 66, <i>N</i> = 102)	Strongly agree	22 (33%)	25 (24%)
	Agree	31 (47%)	63 (61%)
	Neutral	5 (7.6%)	12 (12%)
	Disagree	0 (0.0%)	0 (0.0%)
I feel confident when recommending appropriate PPE from the farming population. This would include the ability to recommend respirators based on specific farm exposures. (<i>N</i> = 66, <i>N</i> = 103)	Strongly agree	6 (9.1%)	19 (8.7%)
	Agree	25 (38%)	51 (50%)
	Neutral	17 (26%)	31 (30%)
	Disagree	7 (11%)	10 (9.7%)
	Strongly disagree	3 (4.6%)	2 (1.9%)

TABLE 4. AMCC Students' Responses to 6-Month Follow-up Survey Statements by Statement and Mean Score on a Likert Scale

Statement	2007–2010 Mean	2011–2012 Mean
My ability to anticipate, diagnose, treat, and/or prevent agricultural occupational illnesses and injuries has improved as a result of taking this course. (<i>N</i> = 66, <i>N</i> = 103)	3.80	4.03
The information received during the course has helped me address the occupational and environmental hazards of the agricultural community in my region. (<i>N</i> = 66, <i>N</i> = 102)	3.71	3.23
I feel confident when recommending appropriate PPE for the farming population. This would include the ability to recommend respirators based on specific farm exposures. (<i>N</i> = 66, <i>N</i> = 103)	3.00	3.53

Note. Scale: 1 = Strongly disagree, 5 = Strongly agree.

in participating in various activities relating to occupational and environmental hazards in the communities and populations they serve (Tables 3 and 4). The 2013 AMCC sites have not yet been sent the 6-month follow-up survey. Data presented in this section are reflective of 2007–2012 participants.

5. Assessment of retained knowledge and changes in practice 6 months following completion of AMCC.

The 6-month follow-up survey also inquired about changes in practice and participation in various activities as a result of having completed the AMCC (Table 5).

6. A list of best practices for presenting the AMCC based on recommendations from our program evaluation and recommended revisions.

Since AMCC was first offered in 2007, instructors and facilitators have made appropriate revisions to the course to enhance student learning based on feedback from students and course evaluation. Course changes include

- Incorporated teaching methods appropriate for adult learners.
- Ensured consistency among AMCC sites.
- Incorporated a distance component at some AMCC sites.

TABLE 5. Activities AMCC Students Participated in Since Taking the Course by Activity and the Number of Students Indicating They Had Participated in the Activity

Activity	2007–2010 Respondents (N = 77)		2011–2012 Respondents (N = 88)	
	n	%	N	%
Attended an AgriSafe webinar.	9	11.7	21	23.9
Changed the health history questions I ask when I see a farmer in my clinical setting.	21	27.3	31	35.2
Referred a farmer for follow-up tests that I normally would not have recommended (example: pulmonary function test, hearing, etc.)	9	11.7	14	15.9
Begun discussions with key leaders and other professionals in my community, so we may collaborate to better serve the unique needs of farm families.	12	15.6	34	38.6
I have used the AgriSafe operations manual as a guide when developing the clinic and conducting screenings.	13	16.9	14	15.9

- d. Expanded AMCC curriculum to include regional issues of agricultural production.
- e. Revised the course textbook.
- f. Evaluated the course certification process and holding house.
- g. Established new AgriSafe affiliated states.
- h. Establish a professional development component for International Society for Agricultural Safety and Health (ISASH).

a. Incorporated teaching methods appropriate for adult learners. Since offering the course in 2007, special consideration has been given to adult learning and education methods based on research. When considering adult education, learners bring a wealth of knowledge and experiences to the classroom—a solid foundation on which to build new information. Adults prefer to be actively engaged in the educational process. One effective way of actively including adult students in the teaching process is through small- or large-group discussions. Group discussions allow for the exchange of old (previous experiences) and new knowledge, foster critical thinking skills, and allow students to test their own theories.⁹

The AMCC curriculum includes case studies and interdisciplinary groups for small-group discussions and a classroom setup conducive for large-group discussions. The final component of each AMCC session is a group presentation in which small groups evaluate a case study and

make recommendations based on the principles of the course.

In Iowa, as in many of the course sites, an important component of AMCC is a farm visit. Previously, students just toured a midwestern farm. Recently, course organizers have added a farm safety audit based on the Certified Safe Farm Program Model.¹⁰ In small groups, students apply what they learned throughout the course to farm equipment and machinery.

b. Ensured consistency among AMCC sites. Ensuring course participants are having the same educational experience despite the location of their training has been a challenge. Variations in presenters and their experiences have caused differences in lectures from one state to the next.

To counteract this, presenters are provided PowerPoint presentations and lecture notes prepared by Iowa faculty. This way, despite the presenter, lectures and content are consistent among sites. Early discussions take place with the site coordinators to discuss topics and potential local professionals who might be become faculty in the training. Their experience and credentials are discussed with local coordinators, and we then reach a consensus on locals who have appropriate credentials, and where there are none available, Iowa faculties fill in. Additionally, selected presenters are provided with copies of the pretest and posttest each student is asked to complete before and after each

AMCC session. If there is a question regarding their area on the tests, presenters are asked to cover that content specifically.

Recognizably, regional faculty may stray from course topics and objective. To help maintain quality and consistency of content, we inform the regional coordinators and faculty that all examination questions are derived from the book, not the PowerPoint slides or individual lectures. This ensures that regardless of where a student took the course, students have equal success at passing the examinations.

c. Incorporated a distance component at some AMCC sites. The Internet has provided opportunities for adult education. Incorporating online technologies into curriculum eliminates the place and time restraints of face-to-face classroom learning without straining budgets.¹¹

Since 2011, several AMCC host sites have been incorporating an online component into their training. These sites have attendance records comparable to those of the traditional AMCC setting. These settings have allowed for students to fit the course into their life, learning and covering topics when it's convenient for them. Most online training sites have a day, or so, of face-to-face meetings at the beginning and the end of the training to allow for the group discussions; however, many of the lectures are presented online between the face-to-face meetings.

In a 2012 survey of course facilitators by the University of Iowa, several respondents identified strengths and weaknesses of the online option. Although it does cut down on travel costs and time and allows students to have access to a specialist in a content area not available locally, there is a lack of personal contact, discussion, networking, and group dynamics that enhance learning.

d. Expanded AMCC curriculum to include regional issues of agricultural production. As AMCC was offered in states other than Iowa, it became clear the curriculum needed to include regional agricultural safety and health issues. Recognizing that there are significant regional differences in agricultural processes and exposures, workforce, climate, and culture, the curriculum needed to address such issues.

e. Revised the course textbook. As the agricultural industry evolves, AMCC must also change in order to stay relevant. Additionally, the course textbook, *Agricultural Medicine: Occupational and Environmental Health for the Health Professions*, should be updated to reflect the course. A 2nd edition of the textbook has been drafted and is in its final stages of review before publication. A new consensus process was held in November 2012 to review topics and format for the course, as well as topics and format for the 2nd edition of the text. Changes to the book include inclusion of new pedagogical features to enhance student learning, such as case studies, pre and post quizzes, key points summary, and adding four short chapters on different international regions, covering the topics in a comparative sense (comparing differences in social cultural norms, health and safety statistics and regulations, major health and safety issues that may differ from the core, and recent or emerging concern in agricultural safety and health).

f. Evaluated the course certification process and holding house. We are aiming to elevate the certification process from the University of Iowa to an agricultural health and safety professional organization. Our aim is to elevate agricultural health and safety to a recognized specialty field in occupational safety and health. Therefore, we are working with organizations such as ISASH, the AgriSafe Network, and Agricultural Safety and Health Council of America (ASHCA) to investigate if one or a combination of these organizations could take on the certification of professionals having achieved the level of knowledge and competency that is required to be considered a professional in the field.

g. Established new AgriSafe affiliated states. In 1987, when the Iowa legislature recognized the need for training in agricultural medicine, a network of agricultural occupational health and safety clinics were created and led to the development of Iowa's Center for Agricultural Safety and Health (I-CASH) in 1990. Until 2003, I-CASH provided consultation and continuing education related to agricultural medicine to health care clinics in Iowa. Interest in the program grew, and in 2003 AgriSafe was created as a national nonprofit membership organization

for rural health care providers. Aimed at assisting health care providers to work with farmers, farm workers, and farm families, the organization provides educational materials and access to additional clinicians with similar concerns and interests.²

As of 2012, the AgriSafe Network has 16 provider members located in seven affiliate states (Illinois, Iowa, Louisiana, Nebraska, North Carolina, North Dakota, and Vermont). Increasing the number of providers as well the number of affiliate states is a priority for the next phase of the program.

The follow-up survey sent 6 months after students complete the AMCC inquires about students' participation and interest in joining the AgriSafe Network. Students who complete the course and pass both examinations with a proctor qualify to be an AgriSafe provider. As of 2012, 21% of respondents to the 6-month follow-up surveys had reported joining or intending to join the AgriSafe Network. The major limitation to joining AgriSafe, as perceived by students who responded to the 6-month follow-up survey, was lack of available funds to join (22%).

h. Established professional development program for International Society for Agricultural Safety and Health (ISASH). We are working with ISASH to create a modification of this course that will require a certification by examination. So far, there is no definition of what an agricultural safety and health professional should be. A committee has designed a 3-day curriculum that will be offered in 2015 as a basic core knowledge and competency to be recognized by ISASH as having a basic training and competency in the field.

RECOMMENDATIONS AND BEST PRACTICES

Recommendations for the future include

- Continue to broaden the geographic reach of the course by recruiting students and potential new course sites in currently underserved areas. Since 2007, students from nearly every state and over ten countries have participated in the course;

however, there are still states and regions of the United States where participation in the course is low or nonexistent.

- Prepare and train agricultural medicine instructors. Ensuring instructors have been thoroughly trained in their content area and understand the objectives and goals of the course will be vital in maintaining course consistency among sites and long-term course sustainability.
- Develop and incorporate adult learning strategies to engage audience members and allow for past experiences to help bridge new knowledge.
- Include topics specific to region/area course is offered. Issues within agricultural safety and health specific to the region the course is hosted should be added to the curriculum.

CONCLUSIONS

Since 2007, AMCC has been hosted 23 times in nine states. Results from 6-month follow-up surveys indicate that the course has increased students' readiness to work with rural populations. Students have changed the questions they ask during interactions with rural patients and feel more confident in recommending appropriate PPE to patients. Additionally, despite changes, including adopting an online teaching/learning approach and expanding the course to various regions of the United States, course facilitators have seen consistency in course quizzes and examination scores over time, indicating successful translation of the course.

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NOTE

i. An AgriSafe provider must pass an AMCC course that has been approved by AgriSafe and pay dues to the AgriSafe Network.

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