

Agriculture, health and medicine: promoting people, places and possibilities across disciplines

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Abstract

Background: The Discipline of Rural Health—the interdisciplinary study of health and health care delivery in rural environments—is now a well-recognised discipline delivered through various Rural Clinical Schools, University Departments, Schools of Rural Health and supported with numerous academic journals. Within rural populations, farm men and women and agricultural workers also live and work. Due to the physical and isolated nature of their work they have additional health, wellbeing and safety needs. Despite continued higher rates of workplace injuries, traumatic death and suicides in farming populations globally, there are few formal programs focused on Agricultural Health and Medicine (AH&M). Recognising this gap, a specialty postgraduate unit of occupational and environmental health that focuses on the anticipation, diagnosis, treatment and prevention of illnesses and occupational injuries in agricultural populations was developed in 2010. The curriculum is designed to enable health care providers to deal more efficaciously with particular illnesses and conditions which farmers, as distinct from other rural people, present. Additionally the curriculum aims to support agricultural professionals (agronomists, agricultural extension officers, veterinary surgeons) to play a role in preventing occupational illness and injury through increased health literacy.

Methods: Quantitative data were collected from students (N=90) who had completed the AH&M unit from 2010-13 to determine

- changes in students attitudes
- any self-reported behavioral changes as a result of completing the unit
- if students found the course to be professionally valuable and useful
- future topics of interest.

Data were analysed using descriptive statistics, frequencies and the chi-square test. Further detail was sought from qualitative responses to open-ended survey questions to inquire about places of work, and current practice.

Results: Over 54% of students (from every state and mainland territory of Australia) responded indicating the high level of commitment to this discipline. Responses were consistent with over 91% agreeing the course improved their ability to diagnose, prevent and treat farming populations. Over 80% of past students were working or practising in rural communities. The results demonstrate that the AH&M unit supports both multidisciplinary care and scholarship and addresses health inequities in agricultural populations.

Conclusions: The AH&M unit addresses in a focused and disciplined method the health of a population with documented need. Importantly, education in AH&M is in line with growing societal expectations that health professionals make prevention a larger priority and are knowledgeable about specific population-based issues.

Recommendation: To address unacceptable and ongoing health disparities prioritisation is required to ensure health care providers are culturally competent to work in agricultural communities and health literacy is increased in the agricultural professions. We recommend— as a minimum— the establishment of an AH&M network to develop, and support those professionals who have studied or have in interest in Agricultural Health and Medicine.

Introduction

In Australia, health outcomes generally worsen as distance from a major city increases.¹ These worse outcomes are illustrated by above-average rates of premature death through heart disease, cancer, diabetes and suicide in those living further away from cities in rural and remote locations.^{2,3}

Agricultural, forestry and fishing workers are a sub-group of rural and remote populations, and according to SafeWork Australia account for the highest number of workplace fatalities in 2010–2011 and the second highest for all years from 2004 to 2011.⁴ It is not only workplace accidents where agricultural populations rate highly in morbidity and mortality statistics. Compounding the high injury rates are poor physical and mental health indicators especially around cardiovascular disease, diabetes, and high-risk alcohol consumption.

Despite these poor health and safety outcomes and an obvious need to improve, engaging farm men and women in health, wellbeing and safety issues is not an easy goal. Neither is engaging the rural professionals supporting these communities, who face the tyranny of distance and often stereotypical and discipline-specific views of service delivery. Despite increasing evidence indicating serious and ongoing inequities in health, wellbeing and safety, farming populations have lagged behind the health progress of metropolitan populations and other industries, such as mining and construction. The reasons for this are multi-factorial—with access to health services, socio-economic factors, health-seeking behaviours and cultural differences or influences important. However, it is also acknowledged that there is a lack of cultural competence within the health care sector in understanding and anticipating agricultural population health needs. Cultural norms and perceived or real professional barriers (consider medicine, nursing, pharmacy, veterinary science, agricultural science and social work boundaries) inhibit the opportunities to cross boundaries and improve health care provision. This lack of cultural competence—knowledge, understanding and empathy for farming—is one of the reported reasons farming populations do not seek health advice.⁵ Additionally, long-term and consistent under-resourcing in health has occurred in rural areas of Australia⁶ which has affected the health, wellbeing and safety of rural and farming populations. Worldwide, rural communities and, in particular, agricultural communities have quite distinct needs that are not being met by models of care and interventions designed for urban populations. Sufficient evidence indicates that the health of farmers and agricultural workers is at risk⁷⁻⁹ potentially worsening, and that specific programs should be designed for these populations.¹⁰ Additionally those working in the agricultural sector—such as agronomists, agribankers, agribusiness, farmers—do not themselves have a good understanding of the health needs of agricultural populations. Increasing the health literacy for the agricultural professions may also assist in addressing these distinct needs and improve health outcomes.

Globally, there are few formal programs that train rural (health and non health) professionals in agricultural health, wellbeing and safety.^{11,12} Additionally, the availability of appropriate preventive services to rural and agricultural populations remain minimal relative to the amount spent per capita in urban areas.^{6,13} Australia has put financial incentives and resources into encouraging health-care providers—particularly medical practitioners and medical specialists—to relocate (including overseas graduates) and stay in rural areas^{10-14,15}. Whilst this is a short to medium term solution it is also of both national (we are not self sufficient in supplying our own medical resources) and international (wealthy countries profit at the expense of developing countries by avoiding the cost burden of training all our own physicians)¹⁶ concern. Further, this response of providing financial incentives means that health care providers can work in rural communities and deliver services to agricultural populations without any understanding of Agricultural Health and Medicine (AH&M). This paper describes the introduction, theoretical context, curriculum and evaluation of a postgraduate Agricultural Health and Medicine unit in Australia.

Agricultural Health and Medicine (AH&M)

'Agricultural medicine' has been defined as the multidisciplinary specialty area of occupational and environmental health focusing on the anticipation, evaluation, diagnosis, treatment and prevention of occupational illnesses and injuries in agricultural populations.¹¹ The major focus of AH&M is for agricultural and health care providers to work across disciplines and across sectors to consider innovative approaches to address the high rates of workplace deaths, preventable illness and injury in farming populations. Exacerbating the poor knowledge base of agricultural health and medicine is the reported difficulty the health workforce has connecting with farm men and women. Many health and

rural professionals describe farmers as 'hard to engage' and 'like a lost tribe'.¹⁷ Prior to the introduction of AH&M in Australia, there were no formal academic units for health care providers to study in order to gain knowledge and develop expertise to prevent, diagnose and treat the broader context of illness or injury that is specific to farming communities. Rather, rural practitioners got the usual 'on the job training' and learning by 'trial and error' rural experience. A key unit outcome is that all students have gained specific knowledge about agricultural health, wellbeing and safety issues.^{4, 7-9} This is also in line with modern societal expectations that health professionals make prevention a larger priority and are knowledgeable about specific population-based issues.¹⁸ Most rural health care providers who work in farming communities learn through experience and by trial and error, which is not unexpected given that globally there are very few formal programs that train medical and health professionals in agricultural health and medicine. As Kelley et al. have commented, '[h]ealth care providers who serve farm communities can positively affect workers' health through the informed care they deliver. Yet, interviews with rural health-care providers reveal limited knowledge about agricultural work'.¹⁹

The AH&M Curriculum and Framework

Agricultural Health and Medicine is a post graduate Australian Qualifications Framework Level 8²⁰ unit and based on the curriculum from the College of Public Health, University of Iowa, one of the few providers of Agricultural Health and Safety training globally. The course is guided by Donham and Thelin's textbook *Agricultural Medicine: Occupational and Environmental Health for the Health Professions*.¹¹ Whilst this is a US text, research conducted by Australian and New Zealand researchers form the basis of all the lectures and learning materials provided. Donham's book is currently being rewritten for a second edition and will now incorporate a short chapter on Australian and New Zealand Agricultural Health and Medicine.

The teaching model utilises both a 5-day intensive residential mode and online learning through the Cloud. Problem based learning and group work solving real agricultural community and public health issues are cornerstones of the course. Students are immersed in the agricultural community during their study of AH&M with visits to livestock exchanges (saleyards) and working farms to help students understand the realities of environment, social determinants, workplace health and safety, pesticides, machinery and livestock interactions (see Table 1 for curriculum content). Students are also required to assess and complete farm work health and safety tools developed by Worksafe¹ and used by industry across the country. This activity demonstrates first-hand, the safety hazards and dangers faced by farmers, agricultural workers and their families. During their week-long residential students also interact and learn from over 15 local and national experts in all areas of AH&M. The curricula team is comprised of practising professionals from public health, medicine, agriculture, psychology, addiction, rural surgery, ergonomic design, respiratory medicine, and veterinary backgrounds highlighting their specific expertise. The curricula is similar to the US based University of Iowa Agricultural Health and Safety subject, but has an increased focus on skin cancers and utilises a different assessment framework.

¹ https://www.worksafe.vic.gov.au/_data/assets/pdf_file/0013/11164/FOR712_-_pdf_of_15_Minute_Farm_Safety_Check_form.pdf

Table 1 Agricultural Health and Medicine 5 day intensive curriculum

| Topic / Content area | AUS |
|---|-----|
| Introduction and overview | ✓ |
| Addiction in farming populations | ✓ |
| Agricultural chemicals and toxicology | ✓ |
| Agricultural populations' comorbidities | ✓ |
| Agricultural environmental health issues | ✓ |
| Agricultural respiratory illnesses | ✓ |
| Agricultural trauma | ✓ |
| ^a AgriSafe—clinical preventive occupational health care | ✓ |
| At-risk populations | ✓ |
| Behavioural and mental-health issues in the farming community | ✓ |
| Biosecurity | ✓ |
| Cancer in the farm environment and agricultural setting | ✓ |
| ^b Rehabilitation among disabled farmers, family and workers | x |
| Ergonomics in agriculture | ✓ |
| Farm dangers/injuries from physical agents (vibration, noise, heat/cold) | ✓ |
| Farm children and youth at risk | ✓ |
| Health assessments for agricultural populations | ✓ |
| Hearing loss and eye injury | ✓ |
| Musculoskeletal injuries and occupational low-back pain | ✓ |
| Occupation and environmental concerns for veterinary pharmaceuticals and chemicals | ✓ |
| Personal protective equipment (including respirators) | ✓ |
| Prevention of illness and injury in agricultural populations (including women, minorities, youth) | ✓ |
| Remote emergency medicine | ✓ |
| Skin cancers of agricultural workers | ✓ |
| Zoonotic diseases | ✓ |

^aFor information on AgriSafe, see <http://www.agrisafe.org/>

^bFor information on rehabilitation, see AgrAbility, <http://www.agrability.org/>

Students are given the opportunity to meet and question these experts throughout the week. A welcome reception is held by the local Shire Council to recognise students and academic presenters. This reception starts to build on cross-sector relationships and is an example of utilising an arts and health approach as it is deliberately hosted at a regional Art gallery. The curator provides a tour and discussion of agricultural landscapes in art, and introduces the concept of the 'Agrarian myth'²¹, inviting students to consider their beliefs about the health of farming people and where these have originated. Many Australian colonial art works show strong, healthy pastoral scenes with wide-open spaces, livestock and families working together happily. Apart from the art gallery, AH&M is further incorporated into the local community with an interactive visit to the livestock exchange (saleyards) and a working family farm – linking the theory and the practicalities in a coherent way. These visits embed the knowledge obtained, and also teaching and public health messages within the broader farming community.

Students are also exposed to a diverse network through the other students who are mostly professionals all working closely with, or influencing (for example rural policy) agricultural communities. Some examples of this cross-sectoral learning environment include pharmacists, staff from correctional facilities involved with agriculture, drug and alcohol addiction specialists, health policy makers, paramedics, nurses, veterinary surgeons, psychologists, agriculturalists, social workers, doctors, agrichemical regulators, and epidemiologists. Importantly the student cohort is broader than both health and agricultural professions, thus making cross-sector collaboration and understanding possible.

AH&M Learning Framework

Agricultural Health and Medicine endeavors to find the balance between theory and the application of theory that excites and engages adult learners. Kolb's adult learning model²² and Kirkpatrick's four levels of learning evaluation²³ are used to engage the cohort of predominantly postgraduate or adult returning students. The iterative nature of Kolb's model encourages students to reflect on their approach to prevention, delivery and practice in farming communities, aiming to motivate insight to the gaps and attitudinal challenges of these populations. Students use (and share) their own experiences to reflect on and give context to the curriculum and improve student-learning engagement.

Between 2010 and 2013 inclusive, 91 students representing all Australian states and mainland territories attended the five-day AH&M unit intensive. The host university uses the annual Student Evaluation of Teaching and Units (SETU) to assess the course. The SETU invites students to agree or disagree to questions using a five-point Likert score on ten questions such as whether the course was well taught, used appropriate online technologies, had adequate resources, had manageable workloads and whether they would recommend the unit to others. The SETU assesses the first two parts—(1) reaction, and (2) learning—of Kirkpatrick's four-part evaluation framework.²³ AH&M has repeatedly received an overall average SETU score of above 4.0, out of a possible 5.0. In 2014, AH&M received an average SETU of 4.36 with a maximum score of 4.67 for the unit being well taught². These consistent and repeatedly high scores were well above the Faculty average. Whilst these scores reflect a positive learning experience, they do not provide any indication of students applying their new knowledge and skills as defined in Kirkpatrick's Evaluation framework²³—(3) behaviour and (4) result. To evaluate these a survey was undertaken.

Methods

Students who had enrolled in AH&M between the years 2010 and 2013 were invited to participate in a survey in 2014. Ninety-one (91) students had fully enrolled in AH&M since 2010, but the study population consisted of 80 students following email bounce backs.

The aim of the survey was to:

- Determine any changes in students' attitudes towards AH&M since taking the unit
- Identify self-reported professional behavioural changes towards AH&M since taking the unit
- Evaluate if participating resulted in them being more professionally valuable and useful
- Identify future topics of interest within AH&M.

An online survey was identified as the most efficient method of reaching the population, given the geographical spread and tendency for moving. However, one limitation of online survey instruments is the generally lower response rate when compared with alternative modes.²⁴ Various types of questions were used throughout the survey, such as multiple choice and open-ended questions. Five-point Likert scale-style questions—one of the most common question methods used to measure attitudes—were used to evaluate attitudes and behaviours. Students were sent three invitations to participate.

Results

An overall response rate of 54.5% was received with Table 2 showing the characteristics of the respondents. Students from all four years (2010–2013 inclusive) participated, with responses more or less evenly spread across the four years. The main vocations of students were nursing 45%, medicine 24% and farmers or agribusiness 24%.

² Vice-Chancellors Award for Excellence in Teaching and Learning 2014 – Agricultural Health and Medicine

Table 2 Demographic characteristics of students from 2010-2103

| | (N=51) | |
|--|--------|------|
| | N | % |
| Year respondents completed the course | | |
| 2010 | 11 | 21.6 |
| 2011 | 16 | 31.4 |
| 2012 | 14 | 27.5 |
| 2013 | 10 | 19.6 |
| Years of experience in practice | | |
| 0-10 | 17 | 33.3 |
| 11-20 | 9 | 17.6 |
| 21-30 | 8 | 15.7 |
| 31-40 | 4 | 7.8 |
| 40+ | 1 | 2.0 |
| Do not work in farming community | 12 | 23.5 |
| Sex* | | |
| Male | 7 | 13.7 |
| Female | 44 | 86.3 |
| Current age, years | | |
| 18-30 | 10 | 19.6 |
| 31-40 | 14 | 27.5 |
| 41-50 | 15 | 29.4 |
| 51-60 | 8 | 15.7 |
| 60+ | 4 | 7.8 |
| Type of population currently working in* | | |
| ^a Rural | 34 | 66.7 |
| Mixed | 7 | 13.7 |
| ^b Urban | 4 | 7.8 |
| Not currently working | 6 | 11.8 |

*Significant difference $p < 0.05$

^aArea serving mostly agricultural populations and characterised by low-density housing.

^bAreas characterised by high-density housing.

The majority of students (66.7 %) completing the survey had spent 11 or more years in practice (working in rural areas or work affecting rural areas), reflecting the return-to-study and continuing-education characteristics of course participants. The majority of students were female (statistically significant $p < 0.05$), and reflects the higher proportion of women in the health professions, with age distribution of students fairly evenly spread. Differences were also noted in the type of population they currently worked in ($p = 0.027$), between rural and urban with over 80% working in rural or mixed populations.

As shown in Table 3, self-reported professional behaviours towards AH&M since taking the unit, showed very high numbers (98.8%) of students indicating their abilities in anticipating, diagnosing, treating and preventing occupational agricultural injuries had improved. Most students (90%) agreed or strongly agreed that AH&M had helped them address occupational and environmental hazards and that the unit had been appropriate to their profession.

Table 3 Self-reported professional behavioural and attitude changes in students n=51

| Behaviour statement | Disagree* n (%) | No opinion n (%) | Agree n (%) | Strongly agree n (%) |
|---|--------------------|---------------------|----------------|-------------------------|
| My ability to anticipate, diagnose, treat and/or prevent agricultural occupational illnesses or injuries has improved as a result of taking this course | 1(2) | 0 | 30(59) | 20 (39) |
| The information received during the course has helped me address the occupational and environmental hazards of the agricultural community in my region | 2(4) | 3(6) | 29(57) | 16(31) |
| The information presented during this course was appropriate for my profession | 2(4) | 4(8) | 26(51) | 19(37) |
| I feel confident/competent discussing agricultural health and safety and medicine topics with my peers and community | 1(2) | 0 | 29 (57) | 21(41) |

| Attitude statement | Decreased* n (%) | No change n (%) | Increased n (%) | Increased significantly n (%) |
|---|---------------------|--------------------|--------------------|----------------------------------|
| After completing the course, my feelings towards the need to attend to the health and safety of farmers and their families has: | 0 | 6(12) | 20(39) | 25(49) |
| Following the completion of the course, my desire and intentions to seek out information on the health of farmers and their families has: | 0 | 7(14) | 23(45) | 21 (41) |

* As no students strongly disagreed or reported a significant decrease these were not included on the table

Pleasingly ninety eight per cent (98%) felt confident discussing agricultural health and safety in their community and with their peers. This reflects very clearly the major goal of the course to develop multidisciplinary and cross-sector rural professionals to prevent, diagnose and treat agricultural health conditions and injuries and advocate for their agricultural communities. Eighty- eight per cent (88%) indicated that since taking AH&M their feelings towards attending to the health and safety of farmers and their families had increased or significantly increased. This was also seen in their reported ongoing efforts to seek out information on the health of farmers and their families (86.3%) and is reflected in the quote below.

'The most valuable part of the course was seeing and hearing the good evidence and data on the impact of health in the agricultural industry and receiving a solid background from the lecturers. Now that I have a solid base, I can feed this into my work, backed up by research done by..... 2010 Student now working in agricultural industry

Respondents also indicated their interest in additional agricultural health and safety topics not currently covered by the unit. Results showed 92.7 % wanted more education on agricultural environmental health issues, and 88.2% indicated they were interested in learning more about agricultural health and comorbidities. Injuries from physical agents, behavioural and mental-health issues and zoonotic diseases were also rated highly, with respondents expressing on-going interest in these topics. There was also a strong desire for more training and continuing education, preferring this to be delivered in the form of ongoing training, conferences and meetings, as illustrated by this comment:

'The course is enlightening, enhancing in understanding the nature of farmer health and injuries as well as enabling the required basic skills to help prevent and address illnesses and injuries. It will be much more helpful for us to have a continued support in terms of sharing information, refresher training and if possible field level—support/supervision visits by the school academics'. 2013 Student working in rural health

Overall 96% of respondents said they would recommend studying AH&M to a colleague. The survey also gave respondents a list of learning approaches and asked them to choose preferred methods. Online learning was chosen by 57% but only if there was opportunity for interaction between the students and presenters, which reflects a preference for Kolb's model of experiential adult learning.²²

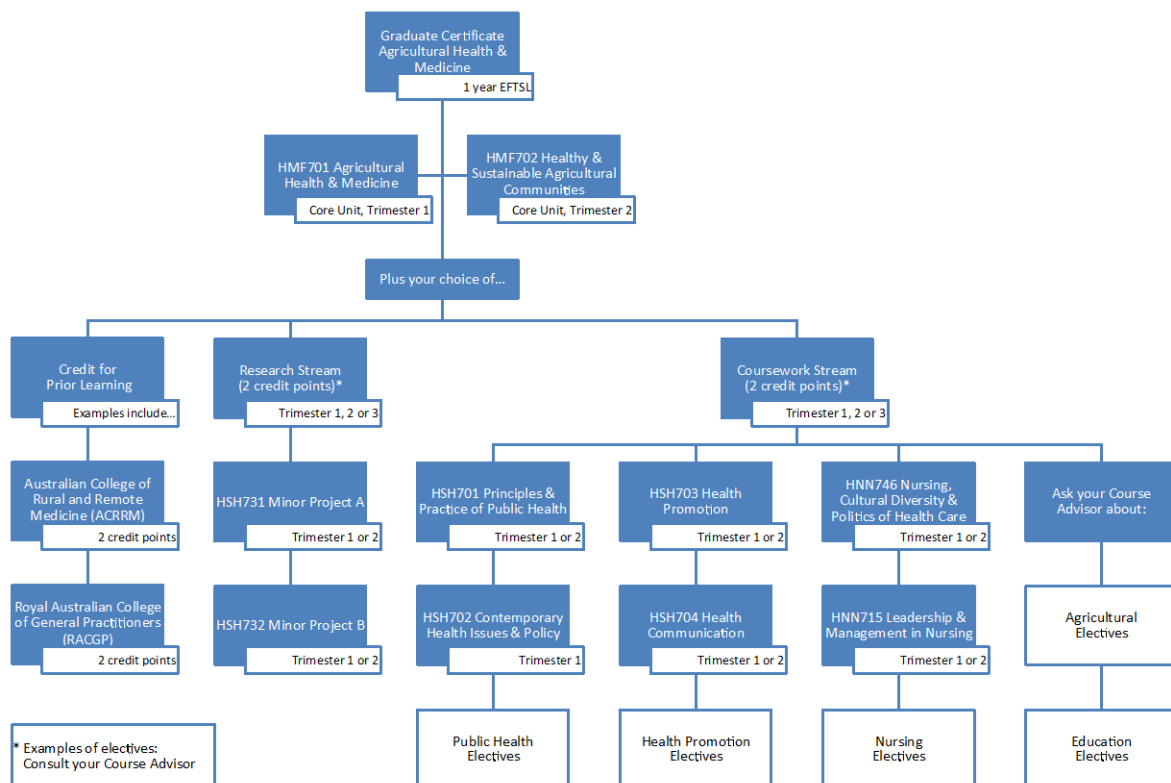
Only (3.6%) indicated they were not interested in participating in any further continuing-education activities.

Discussion

Agricultural Health and Medicine is a core unit of the Graduate Certificate in Agricultural Health and Medicine (GCAHM) (see figure 1) and is also available as an elective unit to a variety of disciplines and accredited for professional development. Examples of these include the Australian Veterinary Association, the Australian College of Rural and Remote Medicine, the Australian Association of Social Workers and the Australian College of Nursing. The hosting university – Deakin University also formally recognises the Australian College of Rural and Remote Medicine (ACRRM) and Royal Australian College of General Practitioners (RACGP) fellowships as credit for prior learning for General Practice registrars enrolled in the full Graduate Certificate of Agricultural Health and Medicine. A research stream is also available for students wishing to complete research as part of their GCAHM.

As AH&M is creating a new, multidisciplinary stream of agriculture, health and medicine professionals that are better equipped to apply AH&M within the context of their profession and communities the authors are hoping to see further contribution to the literature across disciplines.

Figure 1 Graduate Certificate in Agricultural Health and Medicine Course Structure 2014



Source: <http://www.farmerhealth.org.au/page/education/what-is-gcahm>

One of the previous students— a remote and rural pharmacist—has been using her extensive pharmacy skills and AH&M knowledge to publish in the Australian Journal of Pharmacy and introduce other pharmacists to AH&M.^{25, 26} These articles also enable students to claim CPD points. Many of the students were parents, shift workers, farmers or a combination of these and were returning to study for the first time since their undergraduate degree. Being part of a coherent and well-supported community of learners and practitioners was important for their success.

Limitations

Whilst 55% of all students participated in the survey, it is possible that those dissatisfied with the AH&M experience chose not to respond. The sample size was relatively small and therefore the directions of responses may change if more respondents participate.

Conclusion

Inexcusable and unacceptable health disparities exist between rural, farming and metropolitan populations. Addressing these disparities requires a cultural understanding of agricultural populations and their communities. In 2015, the sixth intake of students into Agricultural Health and Medicine commenced, demonstrating ongoing demand to improve the health, wellbeing and safety outcomes of agricultural populations. The results of this study indicate the benefits of the AH&M unit to both health care providers and agricultural professions with all respondents rating the education highly and reporting improved work practices in their agricultural and rural communities. This bodes well for supporting the multidisciplinary and cross-sector scholarship of AH&M, and for addressing health inequities and poorer health outcomes in agricultural populations.

Recommendation

To address unacceptable and ongoing health disparities prioritisation is required to ensure health care providers are culturally competent to work in agricultural communities and health literacy is increased in the agricultural professions. We recommend— as a minimum— the establishment of an AH&M network to develop, and support those professionals who have studied or have an interest in Agricultural Health and Medicine.

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Presenter

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