

Mid-term Evaluation of the National Centre for Farmer Health

Literature Review

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Literature review

This review of literature about farmer health and agricultural medicine forms part of the research for the mid-term evaluation of the National Centre for Farmer Health. It has been guided by the overarching aim of the evaluation: to examine issues of need, effectiveness, and efficiency, and by current relevance to Australian farmers' health, safety, and wellbeing. Searches were conducted in PubMed, Google Scholar, Medline, references in relevant journals, and online sources.

Need for targeted farmer health activity

Rural residents have had higher rates of age-adjusted mortality, disability, and chronic disease than their urban counterparts, though mortality and disability rates have varied more by region than by local status (Jones 2009). Contributing negatively to the health status of farmers were the high risks from workplace hazards, which also affected other members of farm families who lived on the premises and shared in the work. Both farm and rural populations had lower access to health in affordability, proximity, and quality, compared with their nonfarm and urban counterparts. There were similarities and differences between farms and rural households in the factors affecting health, disability and mortality. Farm family health faced risks from the work environment and the incidence of health risk behaviours, chronic disease, and physical limitations. Both farmer and rural households shared the challenges of affordability, medical availability, the quality and coordination of rural care, and opportunities and challenges with health information and communications technology.¹

Bourke *et al* (2010) said what typified public perceptions of rural health was poorer health status, especially among Indigenous Australians, poorer access to health care, and the lack of staff, particularly doctors. Rural residents had higher rates of injury mortality, especially road accidents, higher rates of communicable diseases and disability, as well as higher rates of smoking and alcohol consumption. Another issue was the lack of staff, including nurses, doctors, allied health professionals and health managers. The shortage created high workloads, leading to high rates of burnout and increased waiting times, adding pressure on the existing workforce to be clinically focused and work long hours. This work pattern made recruitment and retention of staff difficult, compounding the workforce shortage.²

Rural Australians faced a higher mental health and lifestyle disease burden (obesity, diabetes and cardiovascular disease) than their urban counterparts (Brumby, Chandrasekara *et al* (2011^b). Ongoing NCFH research showed that the Australian farming community had even poorer physical and mental health outcomes than rural averages. Farm men and women had high rates of overweightness, obesity, abdominal adiposity, high blood pressure and psychological distress when compared with Australian averages.³

Brumby, Martin and Willder (2013) said current data revealed that the health status of people living in rural and remote populations was poorer than their metropolitan counterparts.⁴ Kenny *et al* (2013) said major health inequities between urban and rural populations had resulted in rural health as a reform priority in a number of countries, but while there were some common features between rural areas, it was increasingly recognised that a 'one size fits all approach' to rural health was ineffective if it failed to align healthcare with the needs of a local population.⁵

¹ Jones, C. A. (2009). Health status and health care access of farm and rural populations (No. 57). DIANE Publishing

² Bourke, L., Coffin, J., Taylor, J., & Fuller, J. (2010). Rural health in Australia. *Rural Society*, 20(1), 2.

³ Brumby, S., Chandrasekara, A., McCoombe, S., Kremer, P., & Lewandowski, P. (2011^b). Farming fit? Dispelling the Australian agrarian myth. *BMC research notes*, 4(1), 8

⁴ Rural Industries Research and Development Corporation (2013). *Sustainable Farm Families: Future directions*. Project No. PRJ-003083 by Susan Brumby, John Martin, and Stuart Willder

⁵ Kenny, A., Hyett, N., Sawtell, J., Dickson-Swift, V., Farmer, J., & O'Meara, P. (2013). Community participation in rural health: a scoping review. *BMC Health Services Research*, 13(1), 64.



Agricultural workforces in Australia and abroad experienced excessive work-related mortality, were burdened with high rates of physical and mental disease, and had limited access to health services and low health literacy (Morrissey *et al* 2015). This resulted in poor health outcomes for diseases and illnesses readily manageable in urban settings.⁶

Populations in agricultural communities required health care that was interdisciplinary and cross-sectoral to address the high rate of workplace deaths, preventable injuries and illness (Brumby, Rudolphi *et al* 2017). These rates were compounded by limited access to services and the distinctive personal values and culture of farming populations, which both health and rural practitioners must be aware of to reduce the gap between rural and urban population health outcomes.⁷

Workforce

A very large volume of articles about shortage and role the rural medical workforce has been published in recent decades, both in Australia and internationally, and a series of learned journals is devoted exclusively to the subject. It is important to understand the nature of this literature. Much of it is repetitive, illustrated by the familiar opening themes of papers over the years:

“Solutions to the shortage of general practitioners in rural Australia” (1990)

“Australian workforce reports continue to demonstrate that rural and remote communities have difficulty maintaining an appropriately qualified medical workforce” (1999)

“Limited access to health services remains a significant problem for people living in rural and remote areas of Australia (2007)

“The shortage of healthcare professionals in rural communities is a global problem that poses a serious challenge to equitable healthcare delivery” (2008)

“The lack of health workers in remote and rural areas is a worldwide concern” (2010)

“People living in rural and remote areas face challenges in accessing appropriate health services” (2012)

“There are significant health status inequalities in Australia between those people living in rural and remote locations and people living in metropolitan centres (2013)

“Workforce shortages, retention of medical staff, access to adequate supervision and quality healthcare for patients are ongoing concerns in rural Australia” (2015).

Despite this very large number of articles about the rural medical workforce, its usefulness for the purposes of this review is limited, since it discusses rural practice in general, but not agricultural medicine or farmers' health. Here is a brief summary of its major themes.

In the 1990s, the Australian government invested in a national strategy to encourage recruits to rural and remote general practice.^{8, 9} Many of these initiatives were yet to be thoroughly evaluated against their success in addressing shortages in the rural and remote medical workforce. Strategies should consider personal and professional needs: the most important reasons for choosing a practice rurally included consideration of partner, family and friends, lifestyle goals and career opportunities, specialty requirements, and infrastructure.

⁶ Morrissey, H., Ball, P., & Brumby, S. (2015). Special health needs of Australian farmers. *Australian journal of pharmacy*, 96(1137), 94-97

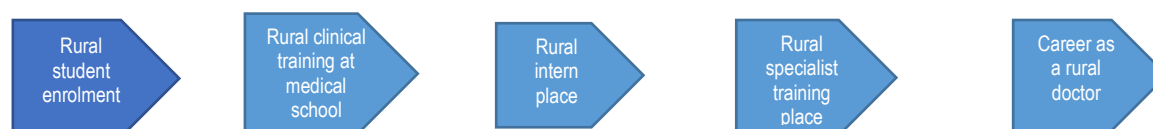
⁷ Brumby, S. A., Rudolphi, J., Rohlman, D., Donham, K. J., & Rudolphi, S. B. J. (2017). Translating agricultural health and medicine education across the Pacific: a United States and Australian comparison study. *Rural and Remote Health*, 17(3931)

⁸ e.g. Strasser, R. P., Hays, R. B., Kamien, M., & Carson, D. (2000). Is Australian rural practice changing? Findings from the national rural general practice study. *Australian Journal of Rural Health*, 8(4), 222-226

⁹ Dunbabin, J., & Levitt, L. (2003). Rural origin and rural medical exposure: their impact on the rural and remote medical workforce in Australia. *Rural and Remote Health*, 3(1), 212



The Mason review recommended that the Commonwealth take leadership in developing a new, more integrated rural training pathway, linking its investment in rural undergraduate medical training with new support for rural intern places and continued growth in specialist training positions, and building on existing programs, maintaining access to primary care and private sector training, and developing a more networked approach to delivering quality education.¹⁰ Mason said that if each of the current medical training initiatives were functioning to deliver their ideal intended outcomes, the following pathway into careers in rural medicine would exist:



Positive rural training experiences increased interest in rural medicine and also encouraged a desire to pursue a career in a rural area. However, fulfilling intentions to practice rurally needed to be concurrent with significant personal and life choices.

The concept of a ‘rural pipeline’ could be used to consolidate evidence and strengthen current approaches to recruitment and retention in rural areas. The four stages identified in the pipeline: making career choices; being attached to place; taking up rural practice; and remaining in rural practice. Medical schools could have a major influence not only by acting as a pipeline but through the development of rural medical training pathways for students interested in rural practice. Factors affecting retention and turnover can be broadly classified under professional issues, social factors, and external community factors.^{11, 12}

Rurality

While evidence indicated that medical graduates with a rural background were more likely to become rural doctors than those with an urban background, Jones *et al* (2012) said that just why this was the case had rarely been studied. They sought to identify the role of social, environmental and economic factors as well as the isolation characteristic of rural environments that either explained or modified the association between rural background and intentions to become a rural doctor.¹³ Most recently, Buttner *et al* (2017) asserted that rural medical graduates “don’t go home”. While one in four students of rural origin returned to work rurally, rural students tended to disperse widely, suggesting there was no benefit in preferential recruitment from any particular rural area. Rather, the benefit was in recruiting more rural students. Rural graduates scattered to towns remote from their own. Although rural-origin students returned in relatively high rates to rural communities, they principally did so for communities other than their place of origin. This confirmed that rural recruits were an important constituent of the rural workforce in Australia.¹⁴

Retention strategies: Personal and professional support arrangements appeared to be associated with decisions to remain in rural practice for substantial periods of time by buffering some of the negative aspects of rural professional life. A comprehensive retention package was needed to address aspects such as staffing, infrastructure, remuneration, workplace organisation, professional environment, and social, family and community support.^{15, 16} Very little was known about the effectiveness of suggested

¹⁰ Mason, J. (2013). *Review of Australian Government health workforce programs*: Recommendation 4.1.

¹¹ Rabinowitz, H. K. & Paynter, N.P. (2000). The role of the medical school in rural graduate medical education: pipeline or control valve? *The Journal of Rural Health*, 16(3), 249-253

¹² Norris, T. E. (2005). The universal importance of the ‘pipeline’. *Australian Journal of Rural Health*, 13(4), 203-204

¹³ Jones, M., Humphreys, J S., & McGrail, M.R. (2012). Why does a rural background make medical students more likely to intend to work in rural areas and how consistent is the effect? A study of the rural background effect. *Australian Journal of Rural Health*, 20(1), 29-34

¹⁴ Buttner, R., Blakely, N., Curtin, S., Wall, B., Pougault, S., Burkitt, T., ... & Playford, D. (2017). What does 'rural return' mean? Rural-origin medical graduates do not 'go home'. *Rural and Remote Health*, 17(3985)

¹⁵ Humphreys, J., Jones, J., Jones, M., Hugo, G., Bamford, E., & Taylor, D. (2001). A critical review of rural medical workforce retention in Australia. *Australian Health Review*, 24(4), 91-102



interventions and their sustainability. Scant evidence was currently available demonstrating the effectiveness of any specific strategy.¹⁷

Implementation of a mentoring program could prove an innovative way to support the rural workforce.¹⁸ Many rural practitioners employed advanced procedural skills in anaesthetics, surgery, obstetrics and emergency medicine. The uniqueness of the role required training programs and assessment methods that reflected the differing needs in rural and remote communities. Evidence suggested that having the opportunity to perform and practice procedural work increased the probability of rural practice and retention.^{19, 20}

There was currently no national approach to support the integration of overseas trained doctors (OTDs) into the workforce.²¹ The importance of OTDs' needs must be considered as part of planning to support GP retention in rural communities. Many of the primary health care (PHC) models did not achieve the critical minimum population to support a comprehensive and sustainable range of PHC services.

The gaps in agreed indicators and benchmarks for PHC services impeded the ability to monitor and evaluate services comprehensively. Many factors affected the health status and primary health care needs of rural and remote communities. While communities varied, understanding the complex web of factors affecting rural health could improve rural health training and programs, and attract and retain doctors as well as other health professionals more effectively.²² Increasing community participation and engagement in the planning, oversight and delivery of care could lead to better generalist based models of care, more rewarding careers, and longer retention.²³

Professional training and education of the Agricultural health workforce

The Rural Industries Research and Development Corporation said the availability of a suitably skilled workforce was essential to sustain effective agricultural systems into the future. It recognized that, in achieving this goal, the agricultural workforce played the central role in the delivery of high quality commodities. As with many workforce sectors, the agricultural sector faced pressures to match its existing and future workforce supply to the demand expressed for services performed by skilled agri-professionals and farmers. This was a particularly challenging in a rural environment where a number of factors had significant impacts on successful workforce recruitment and retention. Importantly health crossed boundaries and was not just the premise of the agricultural industry, but also the health sector and the broader community at large.²⁴

¹⁶ Allan, J., & Ball, P. (2008). Developing a competitive advantage: considerations from Australia for the recruitment and retention of rural and remote primary health workers. *Australian Journal of Primary Health*, 14(1), 106-112

¹⁷ Dolea, C., Stormont, L., & Braichet, J. M. (2010). Evaluated strategies to increase attraction and retention of health workers in remote and rural areas. *Bulletin World Health Organisation*, 88, 379-385

¹⁸ Bourke, L., Waite, C., & Wright, J. (2014). Mentoring as a retention strategy to sustain the rural and remote health workforce. *Australian Journal of Rural Health*, 22(1), 2-7

¹⁹ Bourke, L., Waite, C., & Wright, J. (2014). Mentoring as a retention strategy to sustain the rural and remote health workforce. *Australian Journal of Rural Health*, 22(1), 2-7

²⁰ Sivey, P., Scott, A., Witt, J., Joyce, C., Humphreys, J. (2010). Why junior doctors don't want to become General Practitioners: A Discrete Choice Experiment from the MABEL Longitudinal Study of Doctors. Melbourne Institute Working Paper Series No. 17/10, University of Melbourne

²¹ McGrath, B. P. (2004). Integration of overseas-trained doctors into the Australian medical workforce. *Medical Journal of Australia* 181(11-12), 640-2

²² Health Workforce Australia (2013). The GP Proceduralist (Maternity Services) Workforce in Rural Victoria: Future Demand Analysis. Adelaide: Health Workforce Australia

²³ Pashen, D., Murray, R., Chater, B., Sheedy, V., White, C., Eriksson, L., De La Rue, S., & Du Rietz, M. (2007). The expanding role of the rural generalist in Australia—a systematic review. *Australian College of Rural and Remote Medicine, Brisbane*

²⁴ Rural Industries Research and Development Corporation (2013). *Sustainable Farm Families: Future directions*. Project No. PRJ-003083 by Susan Brumby, John Martin, and Stuart Willder



In 1974, the University of Iowa in the US began training health care professionals to care for farmers' occupational health needs and address the unique health and medical characteristics of agricultural populations. The course was initially developed in 1974 for teaching medical students, family medicine residents and nurses. A postgraduate curriculum was added in 2006 to develop medical/health and rural professionals' cultural competence to work in agricultural communities. This program was established within Iowa as a program of the Center for Agricultural Safety and Health. A 1989 *National Agriculture at Risk Report* indicated there was a great need for agricultural medicine training beyond Iowa's borders. Training was extended to health and safety professionals in 2006, and expanded beyond Iowa borders. The principal component of the program was the 40-hour course, *Agricultural Medicine: Occupational and Environmental Health for Rural Health Professionals—the Core Course*. Before the first phase of this project, a consensus process was conducted with a group of safety and health professionals to determine topics and learning objectives for the course. It is now offered to health and safety professionals in nine states in the United States, auspiced by the University of Iowa, and utilising local practitioners where appropriate. In Australia, a similar course is delivered through Deakin University, School of Medicine.

National Centre for Farmer Health

In 2008, recommendations were made to the Victorian Government to develop a similar agricultural medicine postgraduate unit in Australia, in partnership with Western District Health Service (based in the agricultural centre of Hamilton) and Deakin University. The resulting course, Agricultural Health and Medicine, was developed at the National Centre for Farmer Health, within the School of Medicine at Deakin University, adapting the curriculum framework from the University of Iowa to Australian environs. The curriculum was designed to enable healthcare providers to deal more efficaciously with illnesses and conditions particular to Australian farmers, as distinct from other rural people. The curriculum aimed to also support agricultural professionals (agronomists, agricultural extension officers and veterinary surgeons) to play a role in preventing occupational illness and injury through increased health literacy. Since beginning in 2010, the Australian course has been marketed to encourage and develop relationships across medicine, public health, agriculture, nursing, health sciences, veterinary science, safety and health promotion, reflecting the diversity of agriculture and rural communities in Australia.

The National Centre for Farmer Health (NCFH) has been operating since November 2008. It was officially opened by the Victorian Premier, John Brumby, in July 2009. The Centre evolved from two main sources: the Sustainable Farm Families™ (SFF™) program, a health promotion program addressing farmer health, wellbeing and safety issues since 2003; and a Victorian Travelling Fellowship²⁵ that had examined overseas models for working with agricultural populations, and listed the five key strategic areas adopted by the NCFH: (1) professional training and education - providing undergraduate, postgraduate and continuing education for health professionals, including GPs, nurses, allied health practitioners, vets, agronomists and associated primary industry personnel; (2) applied research and development - expanding the evidence base for effective interventions to improve farm and agricultural workers' health; (3) web based information and services - increasing knowledge and understanding by providing links to quality information and in future by providing e-learning and telemedicine services; (4) AgriSafe™ clinics - innovative occupational health and safety services to farm and agricultural workers; and (5) Sustainable Farm Families™ programs - maintaining farmer health programs, training health professionals to deliver the programs (Sustainable Farm Families™ Train the Trainer) and disseminating research results from the programs.

A 2008 Australian *textbook of Australian rural health* listed the competencies that were important to professional rural practice and clinical decision making. They required an inter-professional approach to health care, emphasising individual variations among rural Australians from different

²⁵ Brumby S. (2006). Sustainable Farm Families - Understanding the triggers and opportunities for improving farming family health in Victoria. Final Report Victorian Travelling Fellowship. Hamilton. Australia.



cultural backgrounds. It emphasised that cultural identity was very individual, and evolved with time and place as the individual adapted to the physical and cultural environment.²⁶

In the second phase of the University of Iowa project (2012–2016), an expanded advisory committee (38 internationally recognised health and safety professionals) was convened to review the progress of the first phase, make recommendations for revisions to the required topics and competencies, and discuss updates to the second edition of the course textbook (*Agricultural Medicine: Occupational and Environmental Health for the Health Professions*). A formal consensus process was held and included an online survey and a face-to-face meeting. The group was charged with the responsibility of developing the next version of this course by establishing best practices and setting an agenda with the long-term goal of developing a national core course in agricultural medicine.^{27, 28}

Fisher and Donham (2011) said the core course training enabled health professionals from various disciplines to function in the anticipation, diagnosis, treatment, and prevention of occupational illnesses and injuries in the farm community.²⁹ Rudolph and Donham (2015) described best practices for operating this program and made recommendations for future courses and other training in the field.³⁰

Despite the continued higher rates of workplace injuries, traumatic death and suicides in farming populations globally, Brumby *et al* (2015) said there were few formal programs focused on Agricultural Health and Medicine. Recognising this gap, a specialty postgraduate unit of occupational and environmental health focussed on the anticipation, diagnosis, treatment and prevention of illnesses and occupational injuries was developed with a curriculum designed to enable Australian health care providers to deal more efficaciously with particular illnesses and conditions which farmers, as distinct from other rural people, present. The curriculum also aimed to support agricultural professionals (agronomists, agricultural extension officers, veterinary surgeons) to play a role in preventing occupational illness and injury through increased health literacy.^{31, 32}

Both the US and Australian courses were guided by the textbook *Agricultural medicine: occupational and environmental health for the health professions*.³³ The US course was modified to include regional and national differences in agricultural processes and exposures, cultural and climatic variations, and variations in the availability and type of health services. Donham and Thelin's book focused on North American agricultural populations, and so the Australian course used relevant published Australian articles. In Australia, between 2010 and May 2017, 213 students attended the agricultural medicine course, representing all Australian states and mainland territories. Students in both the US and Australia came from the nursing, medical doctor, veterinary, mental health, safety and agricultural professions.

²⁶ Liaw, S-T & Kirkpatrick, S. eds, (2008). *A textbook of Australian rural health*.

http://www.farmerhealth.org.au/sites/default/files/2008_Textbook_of_Aust_Rural_Health.pdf

²⁷ Rudolph, J. M., & Donham, K. J. (2015^a). Toward a National Core Course in Agricultural Medicine and Curriculum in Agricultural Safety and Health: The "Building Capacity" Consensus Process. *Journal of agromedicine*, 20(1), 77-83

²⁸ Brumby, S. A., Rudolph, J., Rohlman, D., Donham, K. J., & Rudolph, S. B. J. (2017). Translating agricultural health and medicine education across the Pacific: a United States and Australian comparison study. *Rural and Remote Health*, 17(3931)

²⁹ Fisher, E. L., & Donham, K. J. (2011). Agricultural medicine core course: Building capacity for health and safety professionals. *Journal of agromedicine*, 16(2), 106-116

³⁰ Rudolph, J. M., & Donham, K. J. (2015^b). Increasing the Number of Trained Health and Safety Professionals in Agricultural Medicine: Evaluation of the "Building Capacity" Program, 2007–2013. *Journal of agromedicine*, 20(1), 21-30

³¹ Brumby, S., Cotton, J., & Todd, B. (2015). Agriculture, health and medicine: promoting people, places and possibilities across disciplines. In *13th National Rural Health Conference*. Edited by Gregory G. Darwin: National Rural Health Alliance.

³² Monash University (2016). Graduate Diploma in Occupational and Environmental Health
<https://www.monash.edu.au/pubs/2016handbooks/courses/0160.html>

³³ Donham, K. J., & Thelin, A. (2nd ed, 2016). *Agricultural Medicine: Rural Occupational and Environmental Health, Safety, and Prevention*. John Wiley & Sons



The Sustainable Farm Families™ (SFF™) project was developed in 2003 in Victoria by health care providers, producer-groups, industry, and researchers to address health disparities. In June 2013, three representatives from Alberta, Canada travelled to Australia to investigate the SFF™ program with a view to repeating and transferring SFF™ into the Albertan context.

In 2013, the Farm Safety Centre in Raymond Alberta, attracted funding to pilot the Australian founded SFF™ program with farmers in Alberta. In 2014 staff in Alberta were trained in the methodology of the SFF™ program. In 2015 and again in 2017 an independent evaluation reported the SFF™ Alberta workshops were theoretically consistent with SFF™ Australia. Further, that Canadian farmers rated the SFF™ program very highly indicating its repeatability and transferability.³⁴

A major focus of the NCFH is its conduct of AgriSafe™ clinics. It invites anyone in the agricultural sector to meet with trained agricultural health clinicians for a comprehensive health, safety and occupational exposures check, including blood glucose testing, lipid testing, blood pressure, body mass index calculation, respiratory screening, hearing screening, skin examination, vision testing, urine testing, pesticide exposure (organophosphate specific) testing, fit testing a mask or respirator, and occupational risk. Information regarding farm hazards, and personal protective equipment selection, fitting and sales is also provided, as well as education sessions for community groups, agricultural and health professionals.³⁵

Australian Centre for Agricultural Health and Safety

The Australian Centre for Agricultural Health and Safety (ACAHS) is based at Dubbo in central-west New South Wales. The Centre is an academic unit of the University of Sydney within the Sydney Medical School and School of Rural Health (UDRH). It is also a member of the Australian Rural Health Research Collaboration (ARHRC) together with the University Departments of Rural Health at Broken Hill and Lismore, plus the Centre for Rural and Remote Mental Health, Orange. The Collaboration is administered by the University of Sydney, and funded by the NSW Population Health and Health Services Research Support Program. The Collaboration (ARHRC) is a partnership of the four rural health research centres and associated health services, and has been working to build rural health research and research capacity in New South Wales since 2002. Its mission is to undertake an innovative and robust program of research and development that leads to sustained improvements in the health of rural communities by establishing effective research partnerships between academia, industry, health services and local communities.³⁶

Medical students in Years 3 or 4 of the Sydney University Medical Program can elect to live and work in rural NSW for at least a year. The Broken Hill UDRH offers professional development for health professionals in isolated practice. Sydney students attend the campuses in Dubbo and Orange, and are taught by health practitioners in western NSW. The Northern Rivers UDRH provides education of students for clinical practice in rural health and conducts research relevant to the health needs of rural communities in the Northern Rivers region of NSW and elsewhere. These programs are not specific to farmer health, except for a limited number of research projects in agricultural health and safety, such as

³⁴ Jensen, J., Brumby, S., & Nelson, L. Across the globe: Healthy Farmers, Healthy Farms—The Sustainable Farm Families Project. International Centre for Rural Health

³⁵ National Centre for Farmer Health (2016). AgriSafe™ clinics. <http://www.farmerhealth.org.au/safety-centre/agrisafe-clinics>

³⁶ University of Sydney Medical School (2017). The Australian Centre for Agricultural Health and Safety. <http://sydney.edu.au/medicine/research/rural-health/arhrc/>



farmers' hearing, rules about quad bikes, and on-farm exposure to zinc phosphide.³⁷ In the years to 2011, the ARHRC published annual series on farm-related fatalities regularly updated.^{38, 39}

The ACAHS has been a teaching and research organisation, and offered support to rural health workers, with a strong focus on agricultural safety, but did not offer health assessments or education sessions for farmers.

Web based information and services

At the National Rural Health Conference in 2015, Todd, Brumby and Kennedy commented on the historical lack of rural topics on the Government's *Better Health Channel* website,⁴⁰ even though geographical isolation, lack of internet connectivity, and social isolation influenced the health, wellbeing and safety of rural and remote populations. Social isolation had become increasingly evident as farms became larger, with fewer employees and smaller families. Research highlighted that being socially connected had positive health, wellbeing benefits, while poor access to quality information negatively influenced health, wellbeing and safety rural and remote populations. Farms, they said, were in many ways an ideal place for health promotion as they blended family and work, extended families and communities.

They described a collaborative process of developing a website and online resources to engage, improve access and make a real difference to farmers' lives. In April 2010, the National Centre for Farmers Health website was launched with farmer health, wellbeing and safety fact sheets, shared with the Better Health Channel (BHC). Building on the original website, information was now disseminating through a variety of platforms including Facebook, Twitter, YouTube, BHC, Deakin university webpage, and a mobile-ready website. Given continuing poor digital access in farming communities, the emphasis was to ensure that cross sectoral partnerships were fostered to explore more internet connected, web-based interventions to improve farmer health.⁴¹

In the US, a recent exploratory survey gathered information to disseminate methods for agricultural safety by creating web-based, customisable educational materials for use by safety and health professionals and the farming public. Burgus and Duysen (2017) said it was important to create relatable, research-based safety and health materials, and to deliver information via preferred methods. They collected data by focus groups, surveys, and face-to-face interviews with farmers in seven midwestern states, addressing hazard perceptions, injury prevention measures, resources, and preferred communication channels.

Gender, age, and farming operation influenced communication preferences. Electronic resource distribution was most often mentioned by higher resourced farmers. Retired farmers most often referred to mass media when discussing communication. Full-time farmers preferred to get their safety and health information via email. Organic farmers were more likely to prefer to receive agricultural safety and health information via mobile messages. Farmers aged under 35 preferred the Internet, social media, and e-mail messaging more than older farmers. Younger and middle-aged farmers preferred using informational websites significantly more than older farmers. Middle-aged farmers preferred local papers as a source of farm safety and health information. Farmers aged

³⁷ Sydney Medical School (2016). University Departments of Rural Health. <http://sydney.edu.au/medicine/schools-disciplines-centres/udrh.php>

³⁸ Fragar L, Pollock K, Morton C. The changing profile of Australian farm injury deaths. *Australian & New Zealand Journal of Occupational Health and Safety*. 2008 24(5)

³⁹ e.g. <http://sydney.edu.au/medicine/aghealth/uploaded/Research%20Reports/Farm%20Related%20Injuries%20-%20Mar%20Report%202017.pdf>

⁴⁰ Victorian State Government (2015). *Better Health Channel*. <https://www.betterhealth.vic.gov.au/>

⁴¹ Todd, B., Brumby, S., & Kennedy, A. (2015, January). Pulling people, places, pages and pathologies together through farm health. In *Proceedings of the 13th National Rural Health Conference: People, Places, Possibilities...* (pp. 1-2). National Rural Health Alliance.



under 35 attended safety events and school programs more than older farmers. Retired farmers, and those with a higher percentage of income from farming, were more likely to use radio as a communication medium. As a result of these findings, radio scripts were developed by content experts to be maintained on a central university website. The finding that farmers preferred to see graphics that looked like their own operation prompted creation of customisable templates available on the web. A photo library of agricultural images could be used to create these unique resources.⁴²

E-health had the potential to increase access to services in rural and remote communities, said Bunbury *et al* (2014). The evidence showed that it was as safe, effective and reliable as most conventional methods for interacting with patients while enabling people to stay within their own communities. However, they found there was a paucity of research that identified successful implementation of e-health and remote monitoring in rural communities. They carried out a rapid review of grey and published peer-reviewed literature that, after screening, yielded 16 peer-reviewed publications and three items of grey literature, including two systematic reviews, one literature review, six descriptive reviews of services, and nine reviews of specific interventions and identification of barriers and facilitators to implementing an intervention. There was evidence that e-health could increase access to services across a range of medical specialties without any detrimental effects, and improve opportunities for professional development. E-health was increasingly identified as a cost-effective method to deliver health services and remote monitoring in rural and remote areas.⁴³

Apart from these patently valuable innovations, there is surprisingly little literature on the value of web-based health information. The editor of the Journal Rural Health believed Telehealth would supersede face-to-face consultations in rural Australia by 2025.⁴⁴

Meanwhile, there was previously more attention to what is known as “Social Marketing” – a strategy that assesses barriers to and motivators for adopting recommended behaviours: it does not target education or knowledge, but instead seeks changed behaviour. A literature review by Yoder and Murphy (2012) found many intervention studies that directly referenced social marketing in agricultural safety and health – for example, studies that identified reasons why parents allowed their children to be exposed to hazardous situations on the farm, or reasons why youth engaged in risky farm behaviours - but only two studies showed evidence of systematically researching specific factors to motivate changed behaviour.⁴⁵

Temperley *et al* (2012) examined health and safety issues for small farms in Australia. Small area farmers faced similar hazards to those in larger operations, but received little information on health and safety. For those that did, the usual means was word of mouth or pathways outside the typical communication networks of larger farms. There was significant scope to work with and improve the dissemination of health and safety information for small area farmers, and to transfer this information into practical skills to reduce health and safety risks.⁴⁶

The NCFH Health Centre maintains a comprehensive online list of advice and tools to guide farmers about health and safety, and its website is accredited with Health on Net (HONcode)⁴⁷ which holds

⁴² Burgus, S., & Duysen, E. (2017). Identifying Topics and Dissemination Methods for Agricultural Safety and Health Messages. *Safety*, 3(1), 3

⁴³ Banbury, A., Roots, A., & Nancarrow, S. (2014). Rapid review of applications of e-health and remote monitoring for rural residents. *Australian Journal of Rural Health*, 22(5), 211-222.

⁴⁴ Perkins, D. (2015). Telehealth will supersede face-to-face consultations in rural Australia by 2025. *Australian Journal of Rural Health*, 23(5), 255-256

⁴⁵ Yoder, A. M., & Murphy, D. J. (2012). Using social marketing to address barriers and motivators to agricultural safety and health best practices. *Journal of agromedicine*, 17(2), 240-246

⁴⁶ Temperley, J., Lower, T., & Herde, E. (2013). Safety on small Australian farms. *Rural Society*, 23(1), 101-112

⁴⁷ The Health on the Net Foundation Code of Conduct (HONcode) for medical and health Web sites addresses one of Internet's main healthcare issues: the reliability and credibility of information. <http://www.hon.ch/HONcode/>



Web site developers to basic ethical standards in the presentation of information and helps to make sure readers know the source and the purpose of the information they are reading.⁴⁸

Active farming	<ul style="list-style-type: none"> • Farmer fitness
Alcohol	<ul style="list-style-type: none"> • Alcohol and farmers • Alcohol free events • Drink driving
Breathing and respiratory diseases	<ul style="list-style-type: none"> • Bushfire smoke • Hay fever
Depression	<ul style="list-style-type: none"> • Depression – the facts • Suicide – signs to look for
First aid & emergencies	<ul style="list-style-type: none"> • Ambulance – when to call one • Bites and stings, Bleeding, Burns • CPR, Crush injuries • Eye injury – flash burns, something in your eye • First aid kits • Poisoning’ Shock – physical, Snake bite, Wound care • Diabetes
Healthy weight	
Lung conditions	<ul style="list-style-type: none"> • Aspergillosis, Asthma • Chronic obstructive pulmonary disease • Farmer’s fever, Farmer’s lung • Wood fires and breathing problems • Parsnip rash
Parsnip rash	
Relationships & family	<ul style="list-style-type: none"> • Anger • Farm business planning • Farm succession planning • Relationships and communication
Skin conditions	<ul style="list-style-type: none"> • Dermatitis (eczema) • Scabies
Stress	<ul style="list-style-type: none"> • Fatigue • Sleep problems – insomnia • Stress and farming – coping tips • Stress and your health
Sun protection	<ul style="list-style-type: none"> • Heat stress and heat stroke • Skin cancer – risks and early signs • Skin cancer prevention • Sunburn
Trauma	<ul style="list-style-type: none"> • Trauma – reaction and recovery • Trauma – supporting others

The NCFH Safety Centre also maintains a comprehensive online list of advice and tools to guide farmers about farm safety, and again these are HONcode accredited:

Animals	<ul style="list-style-type: none"> • Animal handling • Children and animals • Sheep and shearing
Animals & diseases	<ul style="list-style-type: none"> • Anthrax • Hand washing

⁴⁸ National Centre for Farmer Health (2016). Health Centre. <http://www.farmerhealth.org.au/safety-centre>



	<ul style="list-style-type: none"> • Hendra virus • Leptospirosis • Lyssavirus • Psittacosis – parrot fever • Q fever • Scabby mouth (Orf)
Bushfires	<ul style="list-style-type: none"> • Bushfire aftermath – hazards • Bushfire safety • Bushfires and water tanks •
Chemicals	<ul style="list-style-type: none"> • Chemicals – safe handling • Chemicals – spray drift • Locus sprays – advice for farmers & health workers
Farmers feet	<ul style="list-style-type: none"> • Farmers footwear • Tinea
First aid & emergencies	<ul style="list-style-type: none"> • Ambulance – when to call one • Bites and stings • Bleeding • Burns • Rises • Eye injuries – flash burns • Eye injury -something in your eye • First aid kits • Poisoning • Shock – physical • Snake bite • Wound care
Floods	<ul style="list-style-type: none"> • Farm preparation and clean up
Machinery & equipment	<ul style="list-style-type: none"> • Confined spaces • Farming can be dangerous • Machinery • Manual handling • Noise prevention • Quad bikes • Tractor safety • Workshop safety
Sun protection	<ul style="list-style-type: none"> • Heat stress and heat stroke • Skin cancer – risks and early signs • Skin cancer prevention • Sunburn
Water safety	<ul style="list-style-type: none"> • Grey water recycling • Water – make it safe to drink • Water tanks and dams – safety tips
Workers & family	<ul style="list-style-type: none"> • Child safety on farms • Electrocution • Falls prevention on farms

Building on the original website, NCFH now disseminates information and encourages engagement through platforms including Facebook, Twitter, YouTube, BHC, Deakin university webpage, Wellness Wednesday, monthly e-News and, a mobile-ready website. In light of continuing continuance of



poor digital access in farming communities, it seeks to foster cross sectoral partnerships to explore more internet connected, web-based interventions to improve farmer health.⁴⁹

In NSW over the past 15 years, the ACAHS developed online resources for health workers to inform them of regulations, guide them in interactions with farmers and farm inspections, and support development of local health programs that address farmers' health and safety needs. The resources are chiefly directed to health professionals, with one set of resources directed to farmers.⁵⁰

Resources for health workers		•
• Farm Health and Safety Toolkit for Rural GPs	• Community programs to improve cardiovascular health and cancer prevention:	
• Farmer Health Poster	• A preliminary review of programs in rural Australia	
• Farm Injury Prevention Poster		
• Farm Health and Injury Chartbook Series		
Resources for farmers		•
• Child Safety on Farms	• - Improving Farm Family Health and Safety	
• - Safety of Older Farmers-	• - Farm Mental Health and Suicide Prevention	
• Safety of Young People on Farms-	• - Cardiovascular Health and Cancer Prevention –	
• Safety of Aboriginal and Torres Strait Islander Rural Workers		
• Tractor and Machinery Safety-	• Vehicle Safety on Farms - development stage	
• All-terrain Vehicle Safety		
PowerPoint presentations for health professionals		
• An Overview of Farm Health and Safety for Health Professionals	• Conducting a Pitstop for farmers program Farm safety with school students - educational resources and farm safety promotion	
• Guide to the Farm Health and Safety Toolkit for Rural General Practices	• Falls prevention in older farmers	
• Farm noise and hearing loss	• – Workshops for great ideas	
• The Older Farmers Program		
Work Health and Safety Policy and Plan		
• Introduction to Work Health and Safety		
• Work Health and Safety Policy		
• Work Health and Safety Legislative Requirements		
• Work Health and Safety Plan		
• Safety Consultation with Workers		
Hazard Checklists		•
• Tractor Checklist	• Farm Infrastructure Checklist	
• Irrigation Pumps and Motors Checklist	• Field and Paddock Checklist	
• Machinery Checklist Vehicle Checklist	• Farm Equipment Checklist	
• Motorbikes, Quads and Side By Side Vehicles Checklist	• Training and Induction Checklist	
• Workshop Checklist	• Emergency and Preparedness Checklist	
	• Injury Management and Return to Work Checklist	
	• Chemicals, Fertilisers and Pesticides Checklist	

⁴⁹ Todd, B., Brumby, S., & Kennedy, A. (2015, January). Pulling people, places, pages and pathologies together through farm health. In *Proceedings of the 13th National Rural Health Conference: People, Places, Possibilities...* (pp. 1-2). National Rural Health Alliance.

⁵⁰ Australian Centre for Agricultural Health and Safety (2002-2017). *Resources for Health workers*. <http://sydney.edu.au/medicine/aghealth/healthworkers/teachinglearning/index.php>



<ul style="list-style-type: none"> • Commodity Specific Checklist • Cotton Picking Checklist • Cattle Yard Checklist • Shearing Shed Checklist • Packing Shed Checklist • Orchard Operations Checklist 	<ul style="list-style-type: none"> • Cherry Picker Checklist • Aquaculture Processing Shed Checklist • Aquaculture Pond and Aerator Checklist • Aquaculture Feed Storage and Movement Checklist
Work Health and Safety Action Plan	<ul style="list-style-type: none"> • Work Health and Safety Action Plan • Safety Training Register • Injury Register and Notification • Fatigue Self-Assessment Tool • Steps to manage fatigue on farms
Injury Register	
Fatigue Management	
Farm Safety Guides	
<ul style="list-style-type: none"> • –Safe Tractor Operation • Safe Use of Quads and Side by Side Vehicles on Australian Farms • Safety in the Farm Workshop • Farm Machinery Guarding • Grain Handling Safety • Guarding Grain Augers • Ergonomics and Manual Handling on Farms 	<ul style="list-style-type: none"> • Horses on Farms • Organic Farm Dusts • Farm Chemicals • Firearms Safety • Heat Stress • Sun Safety • Managing the Pressures of Farming • Child Safety on Farms
Commodity Specific Guides	
<ul style="list-style-type: none"> • Cotton Harvest Safety • Cotton Chipping • Cattle Handling Safety • Avocado Growing and Packing Guide 	<ul style="list-style-type: none"> • WHS for Cotton Farms - Summary Guide • WHS for Grain Farms - Summary Guide • Woolshed Safety - A Practical Guide • WHS for Sugar Cane - Summary Guide • Health and Safety in the Packing Shed

Health conditions

The literature contains many accounts of the particular health conditions that arise in agricultural settings, and the need for their timely and effective management and treatment.

Cancer

Sabesan *et al* (2014) pointed out that providing specialist medical oncology services closer to home for rural patients in a timely way required an increase in the human resources to deal with complex rural cases⁵¹.

Murphy, Sabesan *et al* (2015) said the previous decade had seen an expansion in cancer research in rural and regional Australia, driven in part by the recognition that cancer patients in remote areas experienced poorer outcomes than their metropolitan counterparts. This work had led to the development of more effective cancer networks and new models of care designed to meet the needs of the rural cancer patient. They hoped that the growth of cancer research in regional centres would in time reduce the disparity between rural and urban communities and improve outcomes for cancer patients across both populations.⁵²

⁵¹ Sabesan, S., Roberts, L. J., Aiken, P., Joshi, A., & Larkins, S. (2014). Timely access to specialist medical oncology services closer to home for rural patients: experience from the Townsville Teleoncology Model. *Australian Journal of Rural Health*, 22(4), 156-159

⁵² Murphy, C., Sabesan, S., Steer, C., Yates, P., Booms, A., Jones, V., ... & Goldstein, D. (2015). Oncology service initiatives and research in regional Australia. *Australian Journal of Rural Health*, 23(1), 40-48



Non-melanoma skin cancer was a common and costly cancer in agricultural populations, said Smit-Kroner and Brumby (2015). Prevention and early detection were effective ways to decrease the burden of disease and associated costs. To examine sun exposure and skin protection practices in agricultural workers and farmers, they conducted a thematic review of the literature between 1983 and 2014. Farmers were the most exposed to harmful ultra-violet radiation of all outdoor workers, and the level of reported skin protection by farmers was inadequate. Years of public health campaigns had failed to adequately address farmers' specific needs, leading to increased rates of skin cancer and higher costs. Estimates of sun exposure and skin protection practice indicated that protective clothing was the most promising avenue to improve on farmers' skin protection. Early detection should be part of public health campaigns. They investigated the documented measurable effect the Slip!Slop!Slap! campaign had on agricultural workers and farmers, and recommended its future focus.⁵³

Hearing

Agriculture was long recognised as an industry where workers had high exposure to noise, with risks to farmers' hearing and their general health (Williams *et al* 2015). Hearing difficulty was a significant and often unrecognised problem in farming populations. Health professionals globally had also noted that hearing loss was associated with higher rates of farm injury. Nearly half the participants in previous Sustainable Farm Families programs said they had a hearing difficulty. They had not perceived routine activities such as shearing, unloading wood and auger use as noisy. Actively interested and engaged SFF™ participants were given specific noise management strategies, filling a gap in current farmer education.⁵⁴

While some gains had been documented in health, wellbeing and safety domains, one area that remained a major problem for farm communities was hearing (prevention, access and treatment) and its associated problems (DoHA 2016). Being able to hear effectively was important for farmers to avoid potential accidents and injuries to themselves, work colleagues and bystanders. This was particularly important on farms where the workplace was the home, a place where families lived, children played and friends visited, all near operating machinery, farm equipment, livestock and motorbikes. There were many different sources of noise on farms, such as tractors, workshop tools, livestock, heavy machinery and guns. Noise could also be a safety hazard at work, interfering with communication and making warnings harder to hear. Importantly, recent work estimated that 51% of farm workers are regularly exposed to daily noise above the accepted Australian Exposure Standard known to produce a long-term hearing loss and that women and men have similar noise exposures.⁵⁵

There was also the insidious noise level that farmers were exposed to without realising, such as cattle mooing, pigs squealing, pumps, shearing and machinery. Damage to hearing could be caused by the prolonged and cumulative effect of exposure to excessive noise over many years, or by instant acoustic trauma associated with peak noise levels such as shot guns.⁵⁶

⁵³ Smit-Kroner, C., & Brumby, S. (2015). Farmers sun exposure, skin protection and public health campaigns: An Australian perspective. *Preventive medicine reports*, 2, 602-607

⁵⁴ Williams, W., Brumby, S., Calvano, A., Hatherell, T., Mason, H., Mercer-Grant, C., & Hogan, A. (2015). Farmers' work-day noise exposure. *Australian Journal of Rural Health* (2), 67.

⁵⁵ Australian Government Department of Health and Ageing (2016). *Shhh hearing in a farming environment*, Prepared by Clinical Associate Professor Susan Brumby, National Centre for Farmer Health. <http://hearingservices.gov.au/wps/wcm/connect/hso/b9d22d92-5370-4dec-a95b-2abf97ca9b59/Shhh!+Final+report+31.pdf?MOD=AJPERES>

⁵⁶ Australian Government Department of Health and Ageing (2016). *Shhh hearing in a farming environment*, Prepared by Clinical Associate Professor Susan Brumby, National Centre for Farmer Health. <http://hearingservices.gov.au/wps/wcm/connect/hso/b9d22d92-5370-4dec-a95b-2abf97ca9b59/Shhh!+Final+report+31.pdf?MOD=AJPERES>



Cardiac

The number of deaths from heart disease was higher for rural and remote populations than in urban populations (Brumby 2016). If Australians living in rural and remote areas had the same death rates as urban Australians, there would have been 3,632 fewer deaths due to coronary heart disease in rural areas in 2009-2011⁵⁷.

A pilot study examined the prevalence of cardiac risk factors in a cohort of agricultural workers (Baker *et al* 2011). It assessed their knowledge of local emergency health services, and investigated their decision-making ability to seek help when experiencing chest pain, when and how. Farm men and women from 20 rural Victorian sites underwent health assessments for total cholesterol, blood glucose, weight, height and blood pressure. The participants completed a survey to determine their knowledge of chest pain treatment, local emergency services and likely response to chest pain. This cohort of agricultural workers was at considerable risk of experiencing acute coronary events, but the decisions many of them would have made about when and how to seek medical help for chest pain were at odds with published community guidelines. This highlighted the need for education to improve knowledge of local emergency services, and address behavioural barriers to accessing care.⁵⁸

957 male and 835 female farmers from 97 farming communities across Australia took part in a cross-sectional descriptive study to examine the prevalence of cardiovascular disease risk factors, psychological distress, and associations between physical and mental health parameters (Brumby, Chandrasekara *et al* 2012). The main outcome measures were the prevalence of and interrelationship between overweight, obesity, dyslipidaemia, hypertension, diabetes risk and psychological distress. There was a higher prevalence of overweight, abdominal adiposity and diabetes risk in the farming cohort compared with national data. There was also a positive significant association between the prevalence of psychological distress and obesity, abdominal adiposity, body fat percentage and metabolic syndrome in older participants. This study group of farming men and women exhibited an increased prevalence of cardiovascular disease (CVD) risk factors and comorbidities. The findings indicated a positive association between psychological distress and risk for developing CVD, particularly in the older farmers. If the younger cohort were to maintain elevated rates of psychological distress, it was foreseeable that the next generation of farmers could experience poorer physical health than their predecessors.⁵⁹

Baker *et al* (2011) studied the prevalence of cardiac risk factors in a group of agricultural workers and their decision-making abilities about when and how they would seek help when experiencing chest pain. Most put themselves at risk of dying. 61% of the farmers had cardiac risk factors, and 61% of men and 74% of women were overweight or obese. Asked to name their nearest Emergency Department (ED), 10% nominated health services or towns without an ED, and two thirds believed it was safe to travel to hospital by car while potentially having a myocardial infarction. Improving health literacy among farm men and women was of the utmost importance, as they had higher rates of clinical risk factors and appeared to lack emergency knowledge and services compared with their urban and regional counterparts⁶⁰.

⁵⁷ Brumby, S. (2016) Pulses! <http://www.farmerhealth.org.au/page/latest-farmer-health-in-the-news-2016/2016-january-directors-blog-pulses>

⁵⁸ Baker, T., McCoombe, S., Mercer-Grant, C., & Brumby, S. (2011). Chest pain in rural communities; balancing decisions and distance. *Emergency Medicine Australasia*, 23(3), 337-345

⁵⁹ Brumby, S., Chandrasekara, A., McCoombe, S., Kremer, P., & Lewandowski, P. (2012). Cardiovascular risk factors and psychological distress in Australian farming communities. *Australian journal of rural health*, 20(3), 131-137

⁶⁰ Baker, T., McCoombe, S., Mercer-Grant, C., & Brumby, S. (2011). Farmers with acute chest pain are uncertain how and when to seek help: A pilot study. *Emergency Medicine Australasia*, 23(2), 1-9



Drugs & Alcohol

Allen *et al* (2012) investigated the use of drugs and alcohol by farm and fishery employees and the effects in the primary industry workplace. In six sites, 145 farm and fishing workers, contractors, partners and community leaders completed interviews and surveys. Many described examples of working while they were affected by alcohol, drunk, or hung-over, but voiced little concern about hazardous drinking or its impact on health or work performance. Employers expressed greater concern about getting the work done than the condition of their employees. The pressures of weather, harvest and workforce shortages strongly influenced workplace actions on affected employees. Drug and alcohol interventions such as screening and brief interventions, community action and enforced workplace policies could be effective, but there was no occupational health service, employee assistance program or workplace health screening for the mobile, casual and self-employed primary industries workforce.⁶¹

Nationally and internationally, alcohol consumption patterns were known to be elevated in rural and remote populations (Brumby, Kennedy & Chandrasekara 2013). In the general Australian population, 20.5% of adult males and 16.9% of adult females drank at short-term, high-risk levels. By comparison, farmers were more likely to drink at short-term high risk levels (56.9% of males; 27.5% of women) than the general Australian population. This study sought to explore the relationships between farmers' physical and mental health and their alcohol consumption patterns. The hypothesis was that farmers consumed alcohol at high-risk levels more often than the Australian average, and that this consumption was associated with obesity and psychological distress. The prevalence of short-term, high-risk alcohol consumption in a cohort of farming men and women was significantly higher than the Australian average. These consumption practices were coupled with a range of other measurable health issues in the farming population, such as obesity, hypertension, psychological distress, and age.⁶²

Age

Members of the University Centre for Rural Health North Coast in Lismore (Lower *et al* 2016) said agricultural production in Australia was characterised by a progressively ageing cohort of farming men and women. The demographic profile for agriculture had the average age of farmers as 53 years compared to the all industry mean of 39.5 years.⁶³ Policy directives in agriculture have also been concerned with encouraging older and low producing farmers to retire – with limited success. Yet as farmers age, many have little prospect of inter-generational succession. There is concern that these older farm families are experiencing extraordinary isolation, reduced health and quality of life, and increasing vulnerability with seemingly no choice but to stay on the farm.⁶⁴

An increasing burden of chronic disease and associated health service delivery was expected due to the ageing Australian population (Sajjad *et al* 2016). Injuries also affected health and wellbeing and had a long-term impact on health service use. Comprehensive data on disease and injury was lacking in rural and regional areas of Australia. An *Ageing, Chronic Disease and Injury* study was established to compile data to describe the patterns of chronic disease and injury across western Victoria. This information was vital to establish current and projected population needs, and to inform policy and

⁶¹ Allan, J., Clifford, A., & Meister, P. (2012). Drug and alcohol use by farm and fishing workers: key findings for primary industry. In *2012 Sowing the Seeds of Farmer Health: 2nd Biennial National Centre for Farmer Health Conference*. VURRN Press

⁶² Brumby, S., Kennedy, A., & Chandrasekara, A. (2013). Alcohol consumption, obesity, and psychological distress in farming communities—An Australian study. *The Journal of Rural Health*, 29(3), 311-319

⁶³ Lower, T., Monaghan, N., & Rolfe, M. (2016). Quads, farmers 50+ years of age, and safety in Australia. *Safety*, 2(2), 12

⁶⁴ Rogers, M., Barr, N., O'Callaghan, Z., Brumby, S., & Warburton, J. (2013). Healthy ageing: farming into the twilight. *Rural Society*, 3859-3873.



improve targeted health services delivery, care transition needs and infrastructure development. This study was a model that could be replicated in other geographical settings.⁶⁵

Death rates

The Australian Centre for Agricultural Health and Safety at the University of Sydney published a continuous series of data on farm-related fatalities from 1989 to 2004.^{66, 67}

Fragar *et al* (2011) compared the death rates of Australian male farmers and farm managers aged 25–74 years, with other Australian men in the years 1999–2002. The 4,025 male farmers or farm managers who died in this period represented 3.35% of all male deaths in the 25–74-year age range. The all-cause death rate for farmers and farm managers was 33% higher than for the Australian male population of the same age. Causes of death related to neoplasms, circulatory disease, and all external causes were all statistically higher than the comparison population. Within these groupings, ischaemic heart disease, other circulatory disease, prostate cancer, lymphatic cancer and transport injuries were all significantly higher. These data indicated that Australian male farmers and farm managers were a disadvantaged group in terms of health status.⁶⁸

Dobson *et al* (2010) asked why women's death rates in Australia were higher in rural than urban areas. They examined causes of death of urban and rural women to gain insight into potential explanations for differences in mortality. The participants were a community-based random sample of 12,400 women aged 70–75 years when recruited in 1996. The main variables used were area of residence, survival to 31 October 2006, cause of death, and selected risk factors. The total number of deaths at 31 October 2006 was 2,803 and total number of women still alive was 9,597. Compared to urban women, mortality was higher for women in rural areas, both overall, and for most major causes of death. Death rates were substantially higher for lung cancer and chronic pulmonary disease (CPD), but there were almost no differences among the groups for current smoking or smoking history. Prevalence of overweight and obesity was slightly higher and levels of physical activity lower among women in remote areas. There was little evidence that differences in mortality were owing to the risk factors considered, and alternative explanations such as inequities in health services and environmental hazards should be considered. People in rural areas might suffer from a double disadvantage of poorer health services and exposure to health hazards that are less common in urban areas.⁶⁹

Pollock *et al* (2012) modelled direct and indirect costs of farm-related fatalities and estimated that the 404 traumatic deaths over the period 2001–2004 cost the Australian economy \$650.6 million dollars. Greater resources needed to be directed to farm health and safety interventions to increase their effectiveness and reduce the risk exposure of those visiting, residing, and working on Australian farms.⁷⁰

Mental health

Roberts (2017) said it was highly likely that someone visiting a rural health professional for a specific health concern could also have another health condition. The AIHW report on chronic disease co-

⁶⁵ Sajjad, M. A., Holloway, K. L., Kotowicz, M. A., Livingston, P. M., Khasraw, M., Hakkennes, S., ... & Sutherland, A. (2016). Ageing, chronic disease and injury: a study in western Victoria (Australia). *Journal of public health research*, 5(2)

⁶⁶ <http://sydney.edu.au/medicine/aghealth/publications/publications.php>

⁶⁷ e.g. Fragar, L., Pollock, K., & Morton, C. (2008). The changing profile of Australian farm injury deaths. *Journal of Occupational Health and Safety, Australia and New Zealand*, 24(5), 425

⁶⁸ Fragar, L., Depczynski, J., & Lower, T. (2011). Mortality patterns of Australian male farmers and farm managers. *Australian journal of rural health*, 19(4), 179–184

⁶⁹ Dobson, A., McLaughlin, D., Vagenas, D., & Wong, K. Y. (2010). Why are death rates higher in rural areas? Evidence from the Australian Longitudinal Study on Women's Health. *Australian and New Zealand journal of public health*, 34(6), 624–628

⁷⁰ Pollock, K. S., Griffith, G. R., & Fragar, L. J. (2012). The economic cost of farm-related fatalities in Australia. *Journal of agricultural safety and health*, 18(1), 11–30



morbidity said 75% of people with a chronic health condition also had another long-term health condition, and 55% had three or more co-existing conditions. This was especially the case for mental health conditions. The ABS National Health Survey showed that over 20% of people with a long-term physical illness also had a mental health condition. The recent ABS survey of mental health and co-existing conditions found that 80% of people living with mental illness had a co-existing, mortality-related physical illness. Taken together, these findings underscored the importance of integrating care for rural Australians. Having established a helping relationship, the rural health worker was in a prime position to connect clients to other professionals and services. However, this required the rural health worker to actively explore the possibility of other health issues, be aware of ways to access other services, take responsibility for the next steps to secure appropriate assessment and treatment, and be willing to work in partnership with other professionals. The case for integrated care was so strong, and its advantages so clear, that it was difficult to understand why so many rural people continued to live with undiagnosed co-morbid conditions.⁷¹

Fragar *et al* (2008) described pressures on the mental health and wellbeing of the people in agriculture – the changing structure of family farms, the ageing profile of farmers and farm managers, common pressures reported by farmers that were difficult to cope with, and available data on the prevalence of mental health disorders and suicide in the farming population in Australia. Their audience included policy makers, program planners, and those who delivered programs aiming to influence the mental health and wellbeing of the farming population – the agriculture and health industries, and rural communities.⁷²

A multi-site cohort study of the determinants and outcomes of mental health and wellbeing in rural and remote NSW communities (Kelly, Stain *et al* 2010) drew a stratified random sample of adults from the Electoral Roll, recruiting all adult members of each household. Surveys assessed psychological symptoms, physical health and mental disorders, along with individual, family, household, and community characteristics. A significant relationship was found between recent distress, age and remoteness, with lower scores with age, and the lowest scores in remote regions.⁷³

Fragar *et al* (2010) had found that the rural unemployed in NSW suffered considerable psychological distress and disability, yet were not the target of specific mental health promotion and prevention programs, often occasioned by rural adversity, such as drought. Policy makers and health service providers needed to consider the needs of the rural unemployed or permanently unable to work, and how they might be addressed.⁷⁴

Brumby, Chandrasekara *et al* (2011^a) said studies had confirmed that the rate of mental illness was no higher in rural Australians than in urban Australians, but the rate of *poor mental health outcomes*, in particular suicide, was significantly raised in rural populations. This was thought to be owing to lack of early diagnosis, health service access, the distance-decay effect, poor physical health

⁷¹ Roberts, R. (2017). Integrating rural health care. *Australian Journal of Rural Health*, 25(1), 4-4.

Australian Institute of Health and Welfare (2017). *Chronic Disease Comorbidity*.

Australian Bureau of Statistics (2015). National Health Survey: First Results, 2014-15. Canberra: ABS.

<http://www.abs.gov.au/ausstats/abs@.nsf/mf/4364.0.55.001>

Australian Bureau of Statistics. National Health Survey, Mental Health and co-existing physical health conditions, Australia, 2014-15. Canberra: ABS, 2015.

<http://www.abs.gov.au/ausstats%5Cabs@.nsf/0/C0A4290EF1E7E7FDCA257F1E001C0B84?Opendocument>

Australian Institute of Health and Welfare (2017). *Chronic Disease Comorbidity*. <http://www.aihw.gov.au/chronic-diseases/comorbidity/>

⁷² Fragar L, Henderson A, Morton C, Pollock K. (2008). *The Mental Health of People on Australian Farms – The Facts*. Rural Industries Research and Development Corporation and Australian Centre for Agricultural Health and Safety

⁷³ Kelly, B. J., Stain, H. J., Coleman, C., Perkins, D., Fragar, L., Fuller, J., ... & Beard, J. R. (2010). Mental health and well-being within rural communities: The Australian Rural Mental Health Study. *Australian Journal of Rural Health*, 18(1), 16-24

⁷⁴ Fragar, L., Stain, H. J., Perkins, D., Kelly, B., Fuller, J., Coleman, C., ... & Wilson, J. M. (2010). Distress among rural residents: does employment and occupation make a difference? *Australian Journal of Rural Health*, 18(1), 25-31



determinants and access to firearms. Research by the National Centre for Farmer Health between 2004 and 2009 had revealed a correlation between obesity and psychological distress among the farming community where suicide rates were high. Chronic stress overstimulated the regulation of the hypothalamic-pituitary-adrenal axis associated with abdominal obesity. Increasing physical activity might block negative thoughts, increase social contact, positively influence brain chemistry and improve both physical and mental health. The authors described the design of the Farming Fit study that aimed to examine the effect of physical activity on psychological health and other co-morbidities such as obesity, impaired glucose tolerance, hypertension and dyslipidaemia within a high-risk cohort.⁷⁵

In a companion study, Brumby, Chandrasekara *et al* (2011^b) said rural Australians faced a higher mental health and lifestyle disease burden (obesity, diabetes and cardiovascular disease) than their urban counterparts. Ongoing research revealed that the Australian farming community had even poorer physical and mental health outcomes than rural averages. In particular, farm men and women had high rates of overweightness, obesity, abdominal adiposity, high blood pressure and psychological distress when compared against Australian averages. Within the farming cohort, they observed a significant association between psychological distress and obesity, abdominal adiposity and body fat percentage in the farming population. The authors' hypothesis was that spasmodic physical activity, changing farm practices, and climate variability induce prolonged stress in farmers. Previous studies had indicated that farming populations had elevated rates of psychological distress and high rates of suicide. Australian farmers had also recently experienced challenging climatic conditions including prolonged drought, floods and cyclones. The effect of this long-term stress produced feelings of 'defeat'. A greater understanding of the role cortisol and physical activity had on mental and physical health could positively influence the current rates of psychological distress in farmers⁷⁶.

In a later paper, the same authors repeated that rural and regional Australians had a higher likelihood of mental illness throughout their lifetime than people living in major cities, although the underlying reasons were not yet well defined.⁷⁷

Kelly *et al* (2011) attempted to identify elements in the mental health and wellbeing of a random sample of 2,639 adults in rural and remote communities in NSW. They examined the contributions to wellbeing of external factors such as recent events, social support, exposure to rural adversity, and district characteristics. However, they judged that the chief determinants of current wellbeing reflected individual attributes and perceptions, rather than district-level rural characteristics. This had implications for strategies to promote wellbeing within rural communities through enhancing community connectedness and combating social isolation in the face of major adversities such as drought.⁷⁸

Similarly, Hart *et al* (2011) said drought-related mental health problems had become evident on NSW farms during the worst drought in a century. Local service networks and partner agencies collaborated to promote mental health, education and early intervention. Strategies included raising mental health literacy, organising community social events and disseminating drought-related information. Priority areas were Aboriginal communities, older farmers, young people, women,

⁷⁵ Brumby, S. Chandrasekara, A., McCoombe, S., Torres, S., Kremer, P., & Lewandowski, P. (2011^a). Reducing psychological distress and obesity in Australian farmers by promoting physical activity. *BMC Public Health*, 11(1), 362

⁷⁶ Brumby, S., Chandrasekara, A., McCoombe, S., Kremer, P., & Lewandowski, P. (2011^b). Farming fit? Dispelling the Australian agrarian myth. *BMC research notes*, 4(1), 89

⁷⁷ Brumby, S., Chandrasekara, A., Kremer, P., Torres, S., McCoombe, S., & Lewandowski, P. (2013). The effect of physical activity on psychological distress, cortisol and obesity: results of the farming fit intervention program. *BMC public health*, 13(1), 1018

⁷⁸ Kelly, B. J., Lewin, T. J., Stain, H. J., Coleman, C., Fitzgerald, M., Perkins, D. & Beard, J. R. (2011). Determinants of mental health and wellbeing within rural and remote communities. *Social psychiatry and psychiatric epidemiology*, 46(12), 1331-1342



primary health care and substance use. Over 3,000 people received mental health literacy training in the Rural Adversity Mental Health Program the four years from 2007 to 2010. A free rural mental health support telephone line provided crisis help and referral to rural mental health-related services in drought affected rural NSW. This community development model was accepted and considered effective in helping communities build capacity and resilience in the face of chronic drought-related hardship.⁷⁹

Hossain *et al* (2013) sought to ascertain the extent of mental health problems in rural communities of southwest Queensland, and found the rural communities in this region were under sustained stress resulting from the incursion of the mining and coal seam gas industries, and this had affected community mental health and wellbeing. In twelve workshops, participants highlighted the higher cost of living through increased rental and goods and services costs, a rapid population increase putting strains on health services, and the need for mental health resources, and a greater clarification and coordination of available health services.⁸⁰

Australia's rural communities relied heavily on public-sector provided community mental health services and these services face major recruitment and retention challenges, with many long-term unfilled positions and high staff turnover (Cosgrave *et al* 2015). A comprehensive literature review of Australian studies sought to identify the factors affecting retention of community mental health clinicians working in rural Australia. Thirteen studies identified three key main categories (1) the nature of the work; (2) the multidisciplinary team; and (3) the attractors and detractors of working rurally. Community mental health workers had demanding and stressful roles, and carried heavy workloads. Clinicians working in rural positions faced additional challenges arising from extra work demands and workplace stresses. Studies focused mostly on work and professional considerations, with less research exploring personal and community factors. Future retention focused studies were needed that were multidisciplinary, rural focused and take a multifactor approach.⁸¹

O'Brien *et al* (2015) thought the mental health impact of drought was poorly quantified, and no previous research had demonstrated a relationship between distress and explicit environmentally based measures of drought. With continuing climate change, it was important to understand what drought was and how it might affect mental health. To evaluate any vulnerability in rural and urban communities, they quantified drought in terms of duration and intensity of relative dryness, and identified drought characteristics associated with poor mental health. They analysed 100-years of records of monthly rainfall, linked to one wave (2007–2008) of the *HILDA Survey*. The results showed that a seven-year period of major and widespread drought, and one pattern of relative dryness were associated with increased distress for rural but not urban dwellers. In this way, it was possible to identify a quantitative association between patterns of drought and distress.^{82,83}

Suicide

Australia's farmers constituted a heterogeneous group within the rural population, said Kennedy *et al* (2014). Their literature review contained four broad areas: an understanding of farming communities, families and individuals and the contexts in which they lived and worked; an

⁷⁹ Hart, C. R., Berry, H. L., & Tonna, A. M. (2011). Improving the mental health of rural New South Wales communities facing drought and other adversities. *Australian Journal of Rural Health*, 19(5), 231-238

⁸⁰ Hossain, D., Gorman, D., Chapelle, B., Mann, W., Saal, R., & Penton, G. (2013). Impact of the mining industry on the mental health of landholders and rural communities in southwest Queensland. *Australasian Psychiatry*, 21(1), 32-37

⁸¹ Cosgrave, C., Hussain, R., & Maple, M. (2015). Factors impacting on retention amongst community mental health clinicians working in rural Australia: a literature review. *Advances in Mental Health*, 13(1), 58-71

⁸² O'Brien, L. V., Berry, H. L., Coleman, C., & Hanigan, I. C. (2014). Drought as a mental health exposure. *Environmental research*, 131, 181-187

⁸³ Australian Government department of Social Service Department (n.d.). The Household, Income and Labour Dynamics in Australia (HILDA) Survey. <https://www.dss.gov.au/our-responsibilities/families-and-children/programmes-services/the-household-income-and-labour-dynamics-in-australia-hilda-survey>



exploration of the challenges to morbidity and mortality that these communities faced; a description of the patterns of suicide and accidental death in farming communities; and an outline of what was missing from the current body of research. The primary focus was on Australian peer-reviewed research with supplementary grey literature. The literature variously described farmers as members of both rural farming communities and farming families, and as individuals within an occupational classification. Within each of these classifications, there was evidence of the cumulative impact of a multiplicity of social, geographical and psychological factors relating to work, living and social arrangements that affected the health and wellbeing of farmers and their families, particularly accidental death and suicide. Research consistently demonstrated traumatic death at a greater rate than in the general Australian population, though reductions were found more recently in some modes of farming-related accidental death. Patterns of accidental death and suicide were linked to the changing shape of contemporary farming, and to lethality and accessibility of means. The limitations of suicide and accidental death data were considerable, and recommendations would be made on how these gaps should be addressed.⁸⁴

Suicide among male farmers was often discussed, said Hogan *et al* (2012), but while a wide range of factors were associated, a coherent theoretical framework that incorporated the various factors associated with male farmer suicide had not been developed. They argued that security was central to identity and social competence, and that loss of identity and social practice resulted in a ruptured identity. Reluctance to acknowledge difficulties, misperception of one's problems, and experiences of shame contributed strongly to the will to suicide. The question was how these insights could be translated into suicide prevention programs. Farmers could be engaged in safer and more expectable health care activities, such as monitoring and managing sun or chemical exposures, cholesterol, body mass, and blood pressure before seeking to engage farmers in managing more stigmatised areas of health, such as alcohol consumption, hearing loss, and mental health needs.⁸⁵

An update on the international literature on suicide was made by the American academics Hirsch and Cukrowicz (2014). Suicide was a significant public health concern at a global level, and occurred at a greater rate in rural areas. The review indicated that a growing body of empirical, theoretical, and prevention work had been conducted, with an increasing number of countries represented and articles written. Current data and models suggested that the approach to understanding and preventing rural suicide must be multifaceted, addressing the individual level (traditional risk factors such as psychiatric illness), microsystems (family and peer relations, rural community and social norms. Geographic and interpersonal isolation, agricultural or other hazardous vocational demands, environmental and governmental policies, availability of means, lack of access to care and rural ideologies all appeared to contribute to suicide risk. Interventions must be community-driven, culturally acceptable, and feasible within the context of available resources to be effective.⁸⁶

Suicide in Australian rural communities received significant attention from Australian researchers, health practitioners and policymakers. Farmers and agricultural workers were a focus of particular interest, especially in levels of help seeking for mental health concerns. Kavalidou *et al* (2015) said a less explored area was how much contact farming and agriculture workers who suicided had with health providers for physical, rather than mental, health conditions. It was often assumed that farmers and agricultural workers had lower levels of contact with health care services than other rural residents, though this assumption was not well tested. Using data from the Queensland Suicide Register, Kavalidou *et al* studied levels of contact with health care providers in the three months before the suicide among men in farming and agriculture occupations in rural Queensland. Farming

⁸⁴ Kennedy, A., Maple, M. J., McKay, K., & Brumby, S. A. (2014). Suicide and accidental death in Australia's rural farming communities: a review of the literature. *Rural and remote health*, (Article 2517

⁸⁵ Hogan, A., Scarr, E., Lockie, S., Chant, B., & Alston, S. (2012). Ruptured identity of male farmers: Subjective crisis and the risk of suicide. *Journal of Rural Social Sciences*, 27(3), 118

⁸⁶ Hirsch, J. K., & Cukrowicz, K. C. (2014). Suicide in rural areas: An updated review of the literature. *Journal of Rural Mental Health*, 38(2), 65



and agricultural workers' levels of contact with a GP were not significantly different from other rural men in the area. This suggested that rural GPs were an important point of intervention for farming and agriculture workers at risk of suicide, whether or not they had exhibited any psychiatric illness.⁸⁷

The drought-stricken Australian rural landscape, cultures of farming masculinity, and an economy of value, moral worth and pride formed a complex matrix of subjective dynamics that made suicide a possibility for distressed farmers. An Expert Social Panel in the 2009 Productivity Commission's Inquiry into Drought Support identified a link between suicide and drought, citing Kenny *et al*'s 2008⁸⁸ review findings that 'Australian suicide rates have consistently demonstrated male rates are higher in rural and remote areas than in major cities. Further, there is evidence linking suicide to drought in New South Wales, with an 8 per cent rise in the long-term mean suicide rate being associated with a decrease in precipitation of about 300 millimetres.'⁸⁹

Bryant and Garnham (2015) argued that the centrality of a mental health perspective and notions of stoicism excluded consideration of the ways farmers' cultural identity were linked to their emotions. To illuminate complex connections among subjectivity, moral worth, and affect in understanding farmer suicide, they used theory and literature on agrarian themes of masculine subjectivity and shame to analyse interviews with farmers during times of environmental, social and economic crisis. The idealised notion of the farming man as an 'Aussie battler' emerged from an agrarian mythology in which pride and self-worth were vested in traditional values of hard work, struggle and self-sacrifice. But the structural context of agriculture, shaped by the political economy of neoliberalism, threatened farm economic viability and eroded the pride, self-worth and masculine identity of farmers. The notion of the 'fallen hero' was a retreat from a powerful position of masculine subjectivity imbued with pride, to one of shame. This was centrally important to understanding how suicide emerged as a possibility for farmers.⁹⁰

Arnautovska *et al* (2016) thought research on farmer suicide did not adequately explain the variations in farmers' demographic characteristics. After examining farmer suicides in Queensland and New South Wales, standardized suicide rates from 2000 to 2009 showed a two times higher prevalence of suicide in Queensland (147 cases) than New South Wales (92 cases). Differences in age and suicide method between states did not appear to account for sizeable intra- and interstate variations. Suicide prevention initiatives for farmers should account for different age groups, and also specific place-based risk factors that could vary between and within jurisdictions.⁹¹

Australian farming communities had up to twice the suicide rate of the general population. Men, particularly, demonstrated debilitating self-stigma and perceived stigma associated with an experience of suicide. Kennedy *et al* (2016) designed a research protocol ("The Ripple Effect") which aimed to reduce suicide stigma within the social, cultural, geographical and psychological contexts in which it occurred. A personalised website experience combining shared stories, education, personal goal setting and links to resources would be delivered to farming men aged 30-64 years with an experience of suicide. Pre- and post-surveys would be used to assess changes in self- and perceived-stigma and suicide literacy. Online feedback from participants and semi-structured interviews during follow-up would be thematically analysed. The project would provide information about increasingly

⁸⁷ Kavalidou, K., McPhedran, S., & De Leo, D. (2015). Farmers' contact with health care services prior to suicide: evidence for the role of general practitioners as an intervention point. *Australian journal of primary health*, 21(1), 102-105

⁸⁸ Kenny, P., Knight, S., Peter, M., Stehlik, D., Wakelin, B., West, S. and Young, L. (2008). It's About People: Changing Perspectives on Dryness. A Report to Government by an Expert Social Panel on Dryness, Commonwealth of Australia. p.59.

⁸⁹ Productivity Commission (2009), Government Drought Support, Report No. 46, Final Inquiry Report, Melbourne, p.47 citing

⁹⁰ Bryant, L., & Garnham, B. (2015). The fallen hero: masculinity, shame and farmer suicide in Australia. *Gender, Place & Culture*, 22(1), 67-82

⁹¹ Arnautovska, U., McPhedran, S., Kelly, B., Reddy, P., & De Leo, D. (2016). Geographic variation in suicide rates in Australian farmers: Why is the problem more frequent in Queensland than in New South Wales? *Death studies*, 40(6), 367-372



accessible, innovative approaches to reducing the debilitating health and wellbeing effects of suicide stigma on a population of Australia's farmers.⁹²

Comorbidity

Brumby *et al* (2013) said rural and regional Australian populations experienced more lifestyle associated co-morbidities, including obesity, diabetes and cardiovascular disease. Research conducted by the National Centre for Farmer Health between 2004 and 2009 revealed a positive correlation between obesity and psychological distress among the farming community; and chronic stress was evident. Increasing physical activity might normalise cortisol secretion and thus positively affect both physical and mental health. Farming Fit, a six-month quasi-experimental design assessed the effects of increasing physical activity on obesity, health behaviours and mental health in Victorian farming men and women. 49 overweight or obese men and 29 women had demographic, health behaviors, anthropometric, blood pressure and biochemistry data collected at baseline and at six months. Salivary cortisol and depression anxiety stress scale results were collected at baseline, three and six months. An intervention group of 37 received a personalised exercise program and regular phone coaching to promote physical activity. This group showed significant reductions in body weight and waist circumference. Following the six-month exercise program, the intervention group were lighter, had reduced waist circumference and BMI relative to the control group. Increasing physical activity altered measures of obesity in farm men and women, but did not affect mental health measures or cortisol secretion levels⁹³.

⁹² Kennedy, A. J., Versace, V. L., & Brumby, S. A. (2016). Research protocol for a digital intervention to reduce stigma among males with a personal experience of suicide in the Australian farming community. *BMC public health*, 16(1), 1204

⁹³ Brumby, S., Chandrasekara, A., Kremer, P., Torres, S., McCoombe, S., & Lewandowski, P. (2013). The effect of physical activity on psychological distress, cortisol and obesity: results of the farming fit intervention program. *BMC public health*, 13(1), 1018



Safety

Donham and Thelin's textbook (2016) said those working in the agricultural industry producing food, fibre and fuel experienced one of the highest risks factors among all occupations for injury, illness, and death.⁹⁴

Safe Work Australia affirmed that, from a health and safety point of view, farms were unique. While other industries shared some of the hazards of farming such as plant, chemicals, noise, dust, sun exposure and working with animals, the combination of hazards found in farming, as well as the context in which farm work was done, made farming one of the most dangerous industries in which to work. Agriculture had the highest proportion of self-employed workers of any industry. Self-employed farmers faced the demands and stress of running a business as well as undertaking the hard physical labour involved in farm work. Farm workers often worked alone. There were fewer opportunities for sharing practices, observing and learning from others. Farm workers were often at a distance from help or first aid if an incident occurred. If a farmer was injured or trapped, often there were no workmates to help or get medical help. As well as being places of work, farms were unique in that they are also homes, often with children. The Agriculture sector also employed a higher proportion of older workers than any other industry. While increasing age brought increased experience and skills, it also brought diminution in some areas – reflexes were not as quick, physical strength was lessened, hearing was not as sharp. Jumping on and off a tractor while it is in gear – a preventable risk at any age- doing so at 60 or more increased the likelihood of serious or even fatal consequences.^{95, 96} Safe Work Australia's table of agriculture-related death in 2015 is below:

Worker fatalities: Agriculture sub-divisions by mechanism of incident, 2003 to 2015 (combined)

Industry sub-divisions	Vehicle collision	Rollover of non-road vehicle	Being hit by moving objects	Being hit by falling objects	Falls from a height	Trapped between stationary & moving objects	Being hit by an animal	Other	Total
Sheep, beef cattle and grain farming	109	50	56	34	29	19	16	62	375
Other crop growing	13	10	7	7	..	4	3	8	52
Fruit and tree nut growing	5	10	5	1	3	6	4	3	37
Other livestock farming	13	8	7	1	3	..	1	4	37
Dairy cattle farming	13	5	2	..	..	1	1	3	25
Mushroom and vegetable growing	6	2	6	1	1	..	..	3	19
Nursery and floriculture production	1	1	1	2	..	1	..	1	7
Poultry farming	..	1	1	..	..	..	..	1	3
Agriculture total	160	87	85	46	36	31	25	85	555

In the Agriculture industry, the sheep, beef cattle and grain farming sectors made up more than two-thirds of the number of fatalities (375 out of 555). Of these nearly half involved vehicle collisions or rollover of non-road vehicles. In this group, the most common vehicles involved in these fatalities were tractors and quad bikes (38 fatalities each) and light vehicles and aircraft (29 fatalities each).

⁹⁴ Donham, K. J., & Thelin, A. (2016). *Agricultural Medicine: Rural Occupational and Environmental Health, Safety, and Prevention*. John Wiley & Sons.

⁹⁵ Safe Work Australia (2013). *Work-related injuries and fatalities on Australian farms*. <http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/759/Work-related-injuries-fatalities-farms.pdf>

⁹⁶ Safe Work Australia (2016). *Work-related Traumatic Injury Fatalities, Australia, 2015*. <http://www.safeworkaustralia.gov.au/sites/swa/about/publications/pages/work-related-traumatic-injury-fatalities-australia-2015>



In the United States as well, agriculture was long recognised as one of the most hazardous occupations (Hernandez-Peck 2008). In an industry where, according to the 1997 Agricultural Census, an estimated 500,000 farm workers, a quarter of all farm operators, were 65 years of age or older. Age became a serious factor in potential risk for injuries. Because there was no mandatory retirement age for older farmers, many continued to perform tasks beyond their ability to do so safely. A finding of the US National Institute for Occupational Safety and Health (NIOSH) was that older farmers had a higher rate of skin cancer, high blood pressure, arthritis, and hearing problems compared to older men in the general population. Areas to be addressed included the work histories of older farmers, factors involved in their decisions to retire, lifetime experiences with farm accidents, existing chronic health conditions, and access to health care.⁹⁷

The International Labour Office's Program on safety, health and the environment estimated that 1.3 billion workers were engaged in agricultural production worldwide, representing half the total world labour force. Socio-economic, cultural and environmental factors influenced the health and living conditions of farmers and agricultural workers. The environment in which rural people worked and lived, their standard of living, and their small rural health centres often found it difficult to attract and retain staff. The deterioration of the health status in rural areas increased progressively the greater the distance from urban centres. Mortality rate was also higher in rural areas.⁹⁸

In 2011, members of the ACAHS sought to determine the proportion of Australian farming enterprises with systems and processes that met current regulatory and industry standards for health and safety. Data from 683 farming enterprises were drawn from a nationally stratified random sample representing seven commodity sectors: beef cattle, cotton, dairy, horticulture, grain growing, sheep, and sugar cane. Results indicated low levels of implementation for farm health and safety plans as well as induction for new workers and contractors. Improvements to control major safety hazards are required for farm machinery and implements, farm vehicles, reducing exposure of children to hazards, and the use of helmets when riding quad bikes, motorbikes, and horses. There were considerable variations between commodity sectors.⁹⁹

Donham and Thelin (2016) said several special agriculture risk groups lived in the shadow of the mainstream of agricultural health and safety research and prevention. Women experienced reproductive risks from agricultural exposures, including infertility and abortion. Farm youths could experience illnesses and injuries from farm work, and lived and played in or near hazardous work sites. The elderly might have lost some physical, cognitive, and emotional skills, which increased their risk for illness. Migrant and seasonal farm workers often had cultural and language barriers to overcome before they could safely perform their jobs. These were a few of the hazards these special risk populations experience.¹⁰⁰

In a paper for the European Union about farm safety in Ireland, Griffin (2013) said Ireland had made considerable progress in recent years in reducing the number of workplace accidents and fatalities each year. It was unacceptable that farmers were eight times more likely to die in their workplace than those in the general working population. Despite considerable efforts, agriculture continued to be a difficult sector to achieve sustained improvements in safety and health performance. The Health and Safety Authority continued to prioritise Agriculture Safety and to reduce these

⁹⁷ Hernandez-Peck, M. C. (2008). *Older farmers: Factors affecting their health and safety*. Centre for Studies in Aging School of Social Work and Human Services, Eastern Washington University

⁹⁸ International Labour Office (n.d.). *Safety and Health in Agriculture*. Geneva, ILO.
http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/publication/wcms_110193.pdf

⁹⁹ Lower, T., Fragar, L., & Temperley, J. (2011). Agricultural health and safety performance in Australia. *Journal of agromedicine*, 16(4), 292-298

¹⁰⁰ Donham, K. J., & Thelin, A. (2016). Special risk populations in agricultural communities. *Agricultural Medicine: Rural Occupational and Environmental Health, Safety, and Prevention*, 43



unacceptable numbers, working to bring about a change of culture on Irish farms, and farmers took the time to address and manage key risks and hazards. Farmers deserved a quality of life where they were not continuously working ever longer hours, exposed to risks to life and limb and under ever greater pressure to make a basic living.¹⁰¹

Tractors

In 1999, the Monash University Accident Research Centre reported on the distribution of unintentional machinery injury on farms in Victoria, and their characteristics, to identify research issues and potential intervention strategies (Day & McGrath 1999). They gathered data from the emergency departments of four Victorian regional hospitals for the years 1996-1997. There was an annual average of one child death, six adult work-related deaths, 80 hospital admissions and 210 estimated emergency department presentations for machinery injuries on farms. The tractor was the most common item of machinery involved, accounting for all the child deaths, 71% of the adult work-related deaths, and an estimated 71% of hospital admissions. Males were more frequently killed and injured than females. Passengers accounted for four of the five child tractor deaths. Roll overs and run overs accounted for 57% and 17% respectively of the adult work-related tractor deaths, with the relative contribution shifting towards run overs in the last five years of data. The most common non-fatal injuries included bruising and crushing injuries, fractures, lacerations, and sprains, and the most common body parts injured were the hands and fingers.¹⁰²

In the U.S, about 132 agricultural tractor overturn fatalities occurred each year. Powers *et al* (2001) said the use of rollover protective structures (ROPS), together with seat belts, was the best-known method for preventing these fatalities. However, one impediment to ROPS use was low-clearance situations, such as orchards and animal confinement buildings. To address the need for ROPS easily adapted to low-clearance situations, the National Institute for Occupational Safety and Health had developed a prototype automatically deploying, telescoping ROPS (AutoROPS).¹⁰³

Jensen *et al* (2011) assessed the effect of US social marketing of incentives on dispositions to retrofitting behaviour among farmers whose tractors lacked rollover protective structures. These incentives were offered in three trial regions: Region 1 received rebates; Region 2 received rebates, messages, and promotion and was considered the social marketing region; and Region 3 received messages and promotion. A fourth region served as a control. The social marketing region generated the greatest increases in readiness to retrofit, intentions to retrofit, and message recall. In addition, postintervention stage of change, intentions, attitudes, subjective norms, and perceived behavioural control levels were higher among farmers who had retrofitted tractors. The results showed that a social marketing approach (financial incentives, tailored messages, and promotion) had the greatest influence on message recall, readiness to retrofit tractors, and intentions to retrofit tractors and that behavioural measures were fairly good predictors of tractor retrofitting behaviors.¹⁰⁴

Retro-fitment of rollover protective structures on old tractors continued to be a priority for farm safety in Australia (Franklin *et al* 2006). As the average age of the primary working tractor was 17

¹⁰¹ Griffin, P. J. (2013). *Farming-a hazardous occupation-how to improve health & safety*. Safety and Health in Agriculture. Committee on Agriculture and Rural Development (AGRI).
<http://www.europarl.europa.eu/document/activities/cont/201303/20130321ATT63633/20130321ATT63633EN.pdf>

¹⁰² Day, L. M., & McGrath, A. (1999). *Unintentional machinery injury on farms in Victoria*

¹⁰³ Powers, J. R., Harris, J. R., Etherton, J. R., Snyder, K. A., Ronaghi, M., & Newbraugh, B. H. (2001). Performance of an automatically deployable ROPS on ASAE tests. *Journal of agricultural safety and health*, 7(1), 51-61

¹⁰⁴ Sorensen, J. A., Jenkins, P. L., Emmelin, M., Stenlund, H., Weinehall, L., Earle-Richardson, G. B., & May, J. J. (2011). The Social Marketing of Safety Behaviors: A Quasi-Randomized Controlled Trial of Tractor Retrofitting Incentives. *American Journal of Public Health*, 101(4), 678-684



years, any new tractor safety measure would have a long latency period unless there was some sort of retro-fitment that met the need for the safety item and addressed the barriers to using it¹⁰⁵.

The NCFH website advice said tractors were generally safe to use if operated correctly and fitted with roll over protection structures (ROPS). However, tractors remained a common cause of death and serious injury on farms. Tractors were designed for adults to use, not children. When not used safely, tractors could be involved in runovers, rollovers and falls. Accidents happened in hitching equipment, power take-offs and hydraulics, towing, and during general tractor operation. Inexperienced people should not drive tractors, and passengers should never be allowed to ride on tractors. A tractor should have roll-over protective structures, falling-object protective structures, appropriate guards in place, a cabin if possible to protect from sun, dust and other elements, and adequate ventilation.¹⁰⁶

Quad bikes

While farm transport had benefited from improvements in design features of on-road vehicles, specific design approaches would further enhance safety, for example minimising the potential for crush injuries from quad bike rollovers, Fragar and Lower (2011) said. In addition, as farmers and farm managers were responsible for health and safety in farm work settings, ensuring maintenance of farm roads and laneways, and enforcing compliance with rules relating to speed, passengers and helmet use, were all be important. The road safety industry could play an important role in assisting the small and y family-based farming businesses to adopt these approaches.¹⁰⁷

Quad bikes were imposing a significant injury burden in Victoria, said Clapperton *et al* (2013). Fatalities were frequent, and the number of hospital admissions, often serious, had increased. Children were involved across all levels of severity. A range of prevention approaches, such as mandatory fitting of crush protection devices to protect riders in the event of a roll over, were required.¹⁰⁸

Lower *et al* (2016) said quads were now the leading cause of fatal accidents on Australian farms. Owing to normal age-related physiological and cognitive changes, farmers 50-years of age and above were at increased risk when using quads. These vehicles were not “fit-for-purpose” for many typical agricultural tasks, and the ageing process further exacerbated these risks.¹⁰⁹

Pesticides

Cotton, Lewandowski and Brumby (2015) wrote that Australian farmers and their workers were exposed to a wide variety of pesticides. Organophosphate insecticides were a widely-used class of pesticide used for animal husbandry practices (Naphthalophos for sheep dipping, jetting and drench), crop production for pest control (Dimethoate) and in public health (Maldison for head lice). Acute poisonings with this class of insecticide were reported among agricultural workers and children around the world. Less was known about chronic exposures. Regular monitoring of erythrocyte AChE would enable farmers to identify potential exposure to organophosphate insecticides and act to reduce exposures and improve their health and safety practices. This study aimed to assess and improve the integration of AChE monitoring into routine point of care health clinics, and provide farming and non-farming people with a link between their AChE activity and

¹⁰⁵ Franklin, R. C., Stark, K. L., & Fragar, L. (2006). Intervention strategies for the retro-fitment of Rollover Protective Structures (ROPS) and fleet characteristic, farm tractors. *Safety science*, 44(9), 771-783

¹⁰⁶ National Centre for Farmer Health (2014). *Tractor safety*. <http://www.farmerhealth.org.au/page/safety-centre/tractor-safety>

¹⁰⁷ Fragar, L., & Lower, T. (2010). Motor transport and traffic safety in Australian agriculture: A review. *Journal of the Australasian College of Road Safety*, 21(4), 22

¹⁰⁸ Clapperton, A. J., Herde, E. L., & Lower, T. (2013). Quad bike related injury in Victoria, Australia. *Medical journal of Australia*, 199(6), 418-422

¹⁰⁹ Lower, T., Monaghan, N., & Rolfe, M. (2016). Quads, farmers 50+ years of age, and safety in Australia. *Safety*, 2(2), 12



their household chemical and agrichemical use. This work would provide an evidence base and recommendations for the integration of AChE monitoring into Australian rural health clinics, leading to research which would further quantify pesticide exposure both on the farm and in the home, highlighting the importance of sustaining and providing a safe work and home environment for farming communities.¹¹⁰

Exposure to pesticides has been a constant theme in the farm health literature throughout the world for many years. Here are some typical examples.

A farm-level survey in the Philippines in 1994 measured the effects of pesticide use on farmer health and productivity in two rice-producing regions. It showed that pesticide use had a negative effect on farmer health and thus on productivity, with implications for pesticide policy in developing countries.¹¹¹ A 1995 Philippines study said prolonged exposure to pesticides could lead to cardiopulmonary disorders, neurological and hematological symptoms, and skin disease. Farmers who did not know about the harmful effects of pesticides sometimes overvalued their benefits and used them beyond the private and social optimum levels.^{112,113}

An extended study was done in three villages in Nueva Ecija, Philippines. It surveyed farmers' belief system and pesticide practices related to health and safety. The farmers perceived illness in terms of inability to function. Pesticide to them might not be a threat because (a) they are immune, (b) it was regarded as a medicine needed by the plants rather than a poison, and (c) exposure was only through inhalation and ingestion, not through dermal contact. These perceptions led to their practices showing inadequate protection.¹¹⁴

A Kenyan study in 2011 said farmers in developing countries producing fruit and vegetables for international markets relied on pesticides for agricultural production. Concern with the health consequences of excessive use of pesticides on consumers' medical health and safety of farm workers had led governments to require only pesticides safe for farm workers. However, the safer pesticides were often either more expensive or less effective.¹¹⁵

Khan *et al* (2015) said the need to evaluate pesticide use in rural populations, particularly in developing countries, was urgent. Pesticide use and related risk perceptions were studied among randomly selected farmers from two areas. Farmers in the cotton belt of Punjab, Pakistan were not well informed about correct application practices and safe handling of pesticides. There was an urgent need for training programs on pesticide use to convey more specific information on health hazards from pesticides and avert misleading beliefs about pesticide use.¹¹⁶

Alam and Wolff (2016) studied the impact of pesticide regulations on the adoption of health technologies and health outcomes in Bangladesh. Information from pesticide sellers increased

¹¹⁰ Cotton, J., Lewandowski, P., & Brumby, S. (2015). Cholinesterase Research Outreach Project (CROP): measuring cholinesterase activity and pesticide use in an agricultural community. *BMC public health*, 15(1), 748.

¹¹¹ Antle, J. M., & Pingali, P. L. (1994). Pesticides, productivity, and farmer health: A Philippine case study. *American Journal of Agricultural Economics*, 76(3), 418-430.

¹¹² Pingali, P. L., Marquez, C. B., Palis, F. G., & Rola, A. C. (1995). The impact of pesticides on farmer health: A medical and economic analysis in the Philippines. In *Impact of pesticides on farmer health and the rice environment* (pp. 343-360). Springer Netherlands

¹¹³ Antle, J. M., & Pingali, P. L. (1994). Pesticides, productivity, and farmer health: A Philippine case study. *American Journal of Agricultural Economics*, 76(3), 418-430

¹¹⁴ Palis, F. G., Flor, R. J., Warburton, H., & Hossain, M. (2006). Our farmers at risk: behaviour and belief system in pesticide safety. *Journal of Public Health*, 28(1), 43-48

¹¹⁵ Okello, J. J., & Swinton, S. M. (2011). *International food safety standards and the use of pesticides in fresh export vegetable production in developing countries: implications for farmer health and the environment*. INTECH Open Access Publisher

¹¹⁶ Khan, M., Mahmood, H. Z., & Damalas, C. A. (2015). Pesticide use and risk perceptions among farmers in the cotton belt of Punjab, Pakistan. *Crop Protection*, 67, 184-190



farmers' adopting of precautionary tools and subsequently improved health outcomes. They also found that social learning from peers were key sources of precautionary knowledge.¹¹⁷

An educational intervention was developed to reduce organophosphate pesticides exposure among Indonesian and South Australian (SA) migrant farmworkers. Suratman *et al* (2016) said farmworkers were at risk of exposure to organophosphate (OP) pesticides. Improvements of knowledge and perceptions about OP exposure might be of benefit in reducing exposure. They examined the effectiveness of an educational intervention to improve knowledge and perceptions for reducing OP exposure in these migrant farmworkers. The intervention used group communication for 30 Indonesian farmworkers, and individual communication for seven Vietnamese SA migrant farmworkers. After the intervention, the effects showed significantly improved scores of knowledge (both adverse effects of OPs and self-protection from OP exposure), perceived susceptibility, and perceived barriers among Indonesian farmworkers compared with SA migrant farmworkers. These improvements provide starting points to change the health behaviour of farmworkers, particularly to reduce OP exposure, both at the workplace and at home. The results of this study suggest educational interventions using a method of group communication could be more effective than using individual intervention.¹¹⁸

Community participation

Rural and remote health research highlighted many problems experienced in the bush, but Bourke *et al* (2010) criticised this deficit approach to rural and remote health. They proposed that rural and remote health be viewed as problem-solving, dynamic and improving, rather than as inherently problematic. Alternative ways of thinking were suggested and included: regarding rural and remote communities as change agents; adopting a problem-solving perspective to rural health; actively addressing the social determinants of health; innovative primary health care services and activities; and opportunities for evaluation and research.¹¹⁹

Auckland and Gleeson (2012) explored the potential of 'knowledge partnering' as an innovative framework for developing sustainable partnerships with the farming community and building local capacity for improved farmer health and wellbeing. They described Tasmania as a highly-decentralised State with almost 60% of its population living outside the greater Hobart region. Farming was a primary pursuit for many Tasmanians, with about 17,000 employed in the farming sector. The Tasmanian dairy industry comprised 450 farms which directly employed 1,900 people in the farm sector and an additional 800 people in the processing sector. In 2009 -2010, the University of Tasmania conducted a Sustainable Farm Families™ pilot study with dairy farmers in a region of North West Tasmania. Findings from the study reaffirmed the importance of strong community based partnerships in the design and delivery of effective farmer health promotion programs. It offered a structured way to work with placed based communities and regions to recognise and mobilise knowledge from the "ground up" and to produce new knowledge for desired futures.¹²⁰ Brumby's thesis (2013) also showed that farming populations were interested in their health, wellbeing and safety but that the industry context for engagement was important.

While there was some commonality among rural areas, a one size fits all approach to rural health was ineffective, said Kenny *et al* (2013) as it failed to align healthcare with local population need.

¹¹⁷ Alam, S. A., & Wolff, H. (2016). Do Pesticide Sellers Make Farmers Sick? Health, Information, and Adoption of Technology in Bangladesh. *Journal of Agricultural and Resource Economics*

¹¹⁸ Suratman, S., Ross, K. E., Babina, K., & Edwards, J. W. (2016). The effectiveness of an educational intervention to improve knowledge and perceptions for reducing organophosphate pesticide exposure among Indonesian and South Australian migrant farmworkers. *Risk management and healthcare policy*, 9, 1.

¹¹⁹ Bourke, L., Humphreys, J. S., Wakerman, J., & Taylor, J. (2010). From 'problem-describing' to 'problem-solving': Challenging the 'deficit' view of remote and rural health. *Australian Journal of Rural Health*, 18(5), 205-209

¹²⁰ Auckland, S. R. J., & Gleeson, M. (2012). Innovative partnerships for improved farmer family health in North West Tasmania. In *Sowing the Seeds of Farmer Health Conference* (p. 1).



Community participation was a strategy to engage communities in developing locally responsive healthcare. There was a significant gap in understanding how higher level community participation was best enacted in the rural context. They identified six examples in the international literature of higher level community participation in rural healthcare, but little detail was provided about how groups were established and how the community was represented. Some studies identified the impact of relational interactions and social ties, but outcomes from community participation were not rigorously measured. In an environment of increasing interest in community participation in healthcare, greater understanding was needed of the purpose, process and outcomes of community participation as a priority for research, policy and practice.¹²¹

Farmer, Currie *et al* (2015) explored what happened, over the longer term, after a Scottish community participation exercise to design future rural service delivery models in rural health services design, and why more follow-up actions did or did not happen. The study revisited three communities that engaged in a community participation research method (2008–2010) intended to design rural health services. Only one direct sustained service change was found— introduction of a volunteer first responder scheme in one community. Sustained changes in knowledge were observed. Community members tended to attribute lack of further impact to low participation and methods insufficiently attuned to the social nuances of very small rural communities. Managers tended to blame insufficient embedding in the healthcare system and issues around power over service change and budgets. In the absence of convincing formal community governance mechanisms for health issues, rural health practitioners tended to act as conduits between citizens and the Health Authority. The study highlighted a need for more exploration.¹²²

Strasser *et al* (2015) said “community” had featured in the discourse about medical education for over half a century. It had explored relationships between communities and medical education programs in community-oriented and based medical education, and in recent years, Community Engaged Medical Education (CEME). They presented examples of CEME in action at Flinders University School of Medicine in Australia, the Northern Ontario School of Medicine in Canada, and Ateneo de Zamboanga University School of Medicine in the Philippines. The authors described the ways in which CEME, which featured active community participation, could improve medical education while meeting community needs and advancing national and international health equity agendas. They suggested that CEME could redefine student learning as taking place at the centre of the partnership between communities and medical schools. They cautioned that criteria for community engagement must be sensitive to cultural variations and to the nature of the social contract in different sociocultural settings. CEME was effective in producing doctors who chose to practice in rural and underserved areas. Further research was required to demonstrate that CEME contributed to improved health, and ultimately health equity, for the populations served by a medical school.¹²³

¹²¹ Kenny, A., Hyett, N., Sawtell, J., Dickson-Swift, V., Farmer, J., & O’Meara, P. (2013). Community participation in rural health: a scoping review. *BMC Health Services Research*, 13(1), 64

¹²² Farmer, J., Currie, M., Kenny, A., & Munoz, S. A. (2015). An exploration of the longer-term impacts of community participation in rural health services design. *Social Science & Medicine*, 141, 64-71

¹²³ Strasser, R., Worley, P., Cristobal, F., Marsh, D. C., Berry, S., Strasser, S., & Ellaway, R. (2015). Putting communities in the driver’s seat: the realities of community-engaged medical education. *Academic Medicine*, 90(11), 1466-147



Evaluation of NCFH's programs and initiatives

From 2003 to 2017, NCFH conducted 150 Sustainable Farm Families™ (SFF™) programs – 127 of them in rural and regional Victoria, 10 in Queensland, 3 in New South Wales, 3 in South Australia, 2 in the Northern Territory, 1 in Tasmania and 4 in Western Australia. 2,677 people attended these programs.

From 2005 to 2017, NCFH also conducted 10 SFF™ Train the Trainer workshops where they trained rural health professionals and agricultural facilitators to support the various SFF™ programs across Australia. These workshops ran for 3 days consecutively and then an additional 2 days and were supported via the various funding bodies. Eight of these SFF™ TTT were held in Hamilton, 1 in Adelaide and 1 in Geraldton WA. In total, 186 health professionals and facilitators attended these workshops. Some of the early findings from these workshops were written up in the article where rural professionals reported subsequent positive changes in how they approached health education, clinical practice, and promotion with farm families and agricultural industries.¹²⁴ In 2013 health professionals that had continued working in SFF™ were followed up to see the effect on their service delivery to farmers.

The original pilot of the SFF™ program ran from 2003 to 2007. Boymal *et al* (2007) reported the results of an economic evaluation of the early years of the SFF™ project, setting out four different types of economic analyses: cost, cost-effectiveness, cost-utility, and cost-savings. The economic analysis indicated that the SFF™ project was good value for money in terms of changing behaviours, improving health outcomes for rural Australians, and saving government's money. Interventions designed to influence health related behaviours were particularly effective. Resource allocation decisions by local, state and federal policy makers should ensure the greatest possible contribution to improving rural health from a limited budget.¹²⁵

From 2007 – 2010, the SFF™ program delivered by Western District Health Service (WDHS) in partnership with the Victorian Department of Primary Industries (DPI) and collaborating health agencies and farming groups, reached almost 1,000 farmers across 50 locations in Victoria. An extensive independent evaluation of the SFF™ programs funded in Victoria was undertaken in three parts – process (2008), impact (2009) and impact follow up (2011) by Roberts Evaluation.

The process report judged that the aspects of the program that had been most successful were the different contributions the partner agencies and staff had brought to the content, focus and delivery of the workshops - in particular, the complementarity of the DPI's knowledge of agribusiness and skills in group facilitation, and the local agency and WDHS's knowledge and skills in rural health and health promotion. In 2009, Roberts Evaluation undertook an impact evaluation in 2009, where the perspectives of 153 SFF™ farmers were gathered. The evaluation assessed the impact of the SFF™ program on farmers' perspectives on health, identified the changes farmers made in their lifestyles and farm safety practices, and the outcomes in farmer health and wellbeing, farm management, and ability to cope with challenging circumstances.¹²⁶ These are described in more detail below.

The SFF™ program had a strong reputation for high quality soundly based in research. The delivery and messages of the SFF™ program were consistent across a range of locations and diverse local

¹²⁴ Brumby, S., & Smith, A. (2009). 'Train the trainer' model: implications for health professionals and farm family health in Australia. *J Agromedicine*, 14(2), 112-118. doi:10.1080/10599240902772563

¹²⁵ Boymal, J., Rogers, P., Brumby, S., & Willder, S. (2007). *Living Longer on the Land: A health program that works: An economic evaluation of the Sustainable Farm Families Program*. Rural Industries Research and Development Corporation.

¹²⁶ Roberts Evaluation Pty Ltd (2011). *Sustainable Farm Families Impact Evaluation – Follow-up*. http://www.farmerhealth.org.au/sites/default/files/SFF_Final_Evaluation_Report_2011.pdf



partner agencies. The seed funding supported the involvement of the local health agencies and local industry groups.¹²⁷

The following year's impact follow up (2011) evaluation report by Roberts Evaluation said the perspectives, opinions and stories of the participants painted a rich picture of the value of the SFF™ program and the ways in which it was influencing farmers in their lifestyle and farm management behaviours. The program influenced the capacity of local health agencies and DPI staff. Farmers were overwhelmingly positive in their feedback about the SFF™ program and the benefits it has had for them. A total of 964 farmers attended workshops in the first year (2007-08), and 73% returned for the second year's workshops.¹²⁸

Roberts Evaluation provided independent evaluation throughout the program. Their 2011 impact follow-up report contained the results of interviews conducted in 2010 with 45 farmers, brought together with the results of the health outcome data collected by WDHS over the three years of workshops. The program was clearly appreciated by farmers: throughout the evaluation they consistently praised the content, delivery, value of the health assessments, the workshop presenters and the opportunity to meet with other farmers to discuss and learn about health, wellbeing and safety. Many farmers commented that they would recommend the program to others, and wished it could continue.¹²⁹

Meanwhile, in 2009 Roberts Evaluation was also contracted by the NCFH itself to conduct an independent evaluation of the impact of the original programs (2003-2007) and follow-up workshops on farming participants as part of the SFF™ Future Directions program. The evaluation questions were whether the SFF™ program had: altered the way participants thought about their physical and mental health and safety; influenced participants' health and safety decisions in their daily lives; affected participants' resilience and the way they dealt with change; and influenced the way they saw their health in relation to their farm practices and productivity. A total of 54 out of the total 191 participating farmers were interviewed in October-November 2010: seven of them (including three couples) were interviewed at greater depth to provide case studies of the impacts of the SFF™ program. Six industry partners, three of whom had also acted as workshop facilitators, were also interviewed. The results showed that the SFF™ workshops funded by the Collaborative Partnership at the Rural Industries Research and Development Corporation (RIRDC) and the Geoffrey Gardiner Dairy Foundation over 2004 – 2010 had a profound impact on the farmers involved. Importantly, the workshops were equally positively received by and beneficial for both men and women, farmers of different ages, and farmers working in different industries. In particular, the program had altered the way participants thought about their physical and mental health and safety.¹³⁰

In 2008, the RIRDC published a report by Brumby, Martin and Willder on the current health status of rural farming families in the sugar and cotton industry. The SFF™ project was structured initially around a specific target group of farming families, and covered many health issues including cardiovascular disease, diabetes, stress, gender specific issues, cancers, injury, farm safety and mental health. The program content reflected the primary health factors known to affect farming families and rural communities more generally and recognised the complex environment of farms as workplaces, homes and businesses. Given this complexity, farming families were key players in the shaping, feedback and further development of the program through discussion of shared issues and common problems.

¹²⁷ Storey, J. (2008). *Sustainable Farm Families. Progress Report*. Prepared for the Department of Primary Industries. Roberts Evaluation Pty Ltd

¹²⁸ Storey, J. (2009). *Sustainable Farm Families. Impact Evaluation 2007 -2009*. Prepared for the Department of Primary Industries. Roberts Evaluation Pty Ltd

¹²⁹ Storey, J. & Sison, E. (2011). *Sustainable Farm Families. Impact Evaluation – follow up*. Roberts Evaluation Pty Ltd

¹³⁰ Storey, J. (2010) *Evaluation of Sustainable Farm Families RIRDC Future Directions*. Prepared for National Centre for Farmer Health, Western District Health Service. Roberts Evaluation Pty Ltd



Extension of the initial SFF™ broad acre project into the cotton and sugar industries allowed the project to be tested in agricultural industries with different climatic, industrial and social issues. Farm families from the cotton and sugar industries had embraced the project and were now incorporating health, wellbeing and safety as important business indicators that affected their 'triple bottom line'. Key outcomes were improvement in health of farming members at risk of diseases, positive retention of knowledge gained in the education process, and overall improvement of the participants' health through measurable indicators. All the participants recommended the program to other farming families. SFF™ research had seen an emerging interest from government and policy makers in gaining more understanding about farming health, wellbeing and the future of the family farm enterprise. This resulted in additional funding to expand the action research, number of participants and training opportunities.¹³¹

In 2009, the Collaborative Partnership for Farming and Fishing Health and Safety provided funding to the NCFH and its partners to revisit the participants of the original Sustainable Farm Families project in the broadacre, dairy, cotton and sugar industries covering Victoria, Southern NSW, Central and Southern Queensland, and eastern South Australia. This 'SFF™ Future Directions' project considered the results and hypothesis of the original program, and produced continuing evidence-based information to support and inform future health, wellbeing and safety directions for Australia's agricultural industries. Brumby, Willder and Martin (2010) said farm health and safety historically focused on strategies such as injury prevention, safety audits, and legal responsibilities. But farmer injuries masked deeper health issues, including higher rates of cancer, suicides, cardiovascular disease, and stress. The SFF™ project addressed premature death, morbidity and injury on Australian farms, and illustrated how increasing health literacy through education and physical assessment could lead to improved health and knowledge outcomes for farm families. Based on a model that engaged farm families as active learners committed to healthy living and safe working practices, the project was an effective model for engaging communities in learning and change. It delivered health education and information to farm men and women aged 18 to 75 years in a workshop format. It showed that farm men and women at high risk of premature morbidity and mortality would participate in health education and assessment programs based on industry collaboration, with high levels of individual participation. Farmers would engage with health professionals if programs were presented to them in personally engaging and relevant ways.¹³²

Health data gathered during the SFF™ had been instrumental in providing industry partners with insights into the current health status and relevant health issues of farming men and women. An independent external evaluation of the program undertaken in 2010 (eight years after the program began) measured a randomised sample of broad acre and sugar and cotton producers, and confirmed that the men subsequently pursued regular check-ups in order to maintain their current level of health, and to mitigate the risks associated with increasing age.¹³³

An external economic evaluation for the RIRDC in 2012 found that the social benefits were improved health, safety and wellbeing of future additional participants and their families, and of all future participants owing to the changes to the program influenced by the *Future Directions* project and reinforced messages from earlier SFF™ participation. The economic benefits were: saved health costs for future additional participants and their families who would participate in SFF™ from evidence provided by its Future Directions project; saved long-term public health costs due to preventive health, wellbeing and safety measures taken by additional future participants; and saved health costs for

¹³¹Brumby, S., Martin, J., & Willder, S. (2008). Living longer on the land: case studies of the sustainable farm families program in the sugar and cotton industries

¹³² Brumby, S., Willder, S., & Martin, J. (2010). Milking Their Health for All Its Worth? Improving the Health of Farming Families through Facilitated Learning. *Extension Farming Systems Journal*, 6(1), 1

¹³³ Willder, S., & Brumby, S. (2012). Health Status and Behaviours of Australian Farming Men



participants themselves due to reinforcement of the messages from earlier SFF™ participation. Importantly, Chudleigh *et al* (2012) reported a benefit-cost ratio of 5.6 to 1.¹³⁴

In 'Sustainable Farm Families: Future directions', Brumby, Martin and Willder said there was a lack of understanding of the specific health statistics of rural farming populations. The ABS classified rural health populations by location rather than by agricultural industry or living on farms. The SFF™ Future Directions program aimed to fill this gap by providing evidence-based information and support to Australia's agricultural industries. The agricultural industries involved in this study were mixed grazing, wool production, cropping, and beef production at Benalla, Hamilton, Swan Hill and Horsham in Victoria, Clare in Eastern South Australia, cotton production at Wee Waa in NSW, Dalby in Southern Queensland, sugar production at Ayr and Ingham in central Queensland. Broadacre farming described large scale farming such as mixed grazing, wool production, cropping, and beef production. A partnership ethos was essential to the ongoing success of the SFF™ project would largely depend on partnership arrangements, especially rural and regional health services, agricultural industry groups, universities and a whole of government approach. The report recommended creating support for a national SFF™ project to allow farmers across Australia to participate in a SFF™ program. All Australian agricultural industries should consider sponsoring a SFF™ program for their farmer members across Australia.¹³⁵

Recent research has been undertaken to discover how health professionals who had participated in SFF™ Train the Trainer (SFF™ TTT) programs had utilised knowledge and extended the skills learned in the initial SFF™ TTT, and how this had affected subsequent delivery of health education to farm families. Of the 120 health professionals who had participated in SFF™ TTT, 37 responded to a survey. Respondents were predominantly nurses from a community/primary health background (62%) and 46% of the health professionals lived on a farm themselves. After completing the SFF™ TTT, 84% reported that farmer health issues had become more visible to them, 92% said that the SFF™ had benefited or enhanced their career and 35% had subsequently delivered 3 or more SFF™ programs themselves. All of the 46% of health professionals who live on a farm indicated they had made changes to their own farming practice, and personal health and wellbeing as a result of undertaking the SFF™ TTT program.¹³⁶

¹³⁴ Chudleigh, P., Simpson, S., & Lai, J. (2012). Economic Evaluation of Investment in the Farming & Fishing Health & Safety, R&D Program Publication Nos. 11/170

¹³⁵ Brumby, S., Martin, J., & Willder, S. (2013). Sustainable Farm Families: Future directions. RIRDC Publication No. 11/169

¹³⁶ Smith, A., Brumby, S. & McDonald, A. (2017). How do rural nurses educate, learn and develop from working with farm families on health? Draft manuscript being prepared for publication.



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