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RESEARCH ARTICLE

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'Being a farmer, I mostly always think there is something more important to do': A mixed methods analysis of the skin cancer detection practices of Australian farmers

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Abstract

Issue Addressed: Farmers experience skin cancer and die from melanoma at significantly higher rates than the general Australian population. This study examined Australian farmers' engagement with self-skin examinations (SSE), participation in clinical skin examinations (CSE) by a health professional, and self-reported barriers to engagement with these important skin cancer detection practices.

Methods: A cross-sectional, mixed-methods design was used. Australian farmers were recruited through an industry-based organisation representing livestock farmers. Farmers ($N = 498$; 22–89 years; 83.1% male) responded to a paper-based survey that included closed- and open-ended questions.

Results: Farmers reported engagement with self-conducted SSE and routine CSE that was comparable to findings in the general population, but 29.4% of farmers reported that they had not sought a CSE as soon as possible after noticing changes to their skin. Farmers reported a range of barriers to SSE, including physical difficulties examining their skin, difficulties identifying changes in their skin, forgetfulness, and lack of motivation. Barriers to CSE included accessibility, cost, difficulties finding the right doctor, and avoidance and complacency.

Conclusions: There is a need to make clinical skin cancer detection more accessible to farmers, in addition to promoting self-skin examination and help-seeking behaviours within this at risk population.

So What? Novel approaches are needed to address systemic barriers faced by Australian farmers. These may include the use of teledermatology or artificial intelligence to assist with CSE. Remote training delivery methods may be also utilised to teach SSE skills to farmers who may be otherwise unable to access such opportunities.

KEYWORDS

agriculture, health behaviour, occupational medicine, physical examination, rural health, self-examination, skin neoplasms

1 | INTRODUCTION

Australia has one of the highest rates of skin cancers in the world,[1,2] and it is estimated that two-thirds of all Australians will receive treatment for skin cancer in their lifetime.[3,4] Eighty per-cent of newly diagnosed cancers in Australia are melanoma or non-melanoma skin cancers (NMSC: including basal cell carcinoma and squamous cell carcinoma).[5] This is largely attributed to the high levels of ambient solar ultraviolet radiation (UVR) to which Australians are exposed.[6] Exposure to solar UVR is thought to play a causative role in 65% of melanoma and 90% of non-melanoma skin cancers.[7,8] The risk of developing skin cancer increases with the level of exposure to solar UVR and, in particular, with repeated exposure over time.[9] Given the nature of their work, farmers and agricultural workers experience chronic occupational exposure to solar UVR, at levels estimated to be six to eight times greater than indoor workers.[10,11] Unsurprisingly, the risk of skin cancer among farmers and agricultural workers is significantly greater than in the general population,[12,13] and Australian farmers have a 60% higher mortality rate from melanoma than other Australians.[14]

It is well-established that early detection is associated with improved survival[15,16] and reduced burden for the patient, as well as the health care system.[17,18] Early detection of skin cancer can be achieved through regular examination of one's skin on the whole body (self-skin examination; SSE) or a skin check administered by a health professional (clinical skin examination; CSE).[19] However, farmers tend to be reluctant to prioritise their health[20] and are known to underestimate their risk of skin cancer.[21–23] Research examining the barriers to seeking help for skin cancer detection found that farmers were more likely than their non-farming rural counterparts to engage in problem minimisation and normalisation (i.e., dismissing possible skin cancer as something not to worry about) when faced with skin cancer-related concerns.[24] Woods et al.[25] found that the farmers they surveyed reported working for more than 40 h per week in the sun, with many not adequately protecting themselves from solar UVR exposure. Concerningly, following participation in CSE, potential skin cancers were found on 30% of the farmers they surveyed.[25] Similar trends have been observed internationally. Zink et al.[26] reported low levels of engagement with skin cancer prevention behaviours among farmers in Germany and found that only 31.9% of those they surveyed had ever received a CSE. In another study, they found that farmers had the lowest perceived skin cancer risk when compared with other outdoor workers.[23]

To improve knowledge in this area, the aim of the present study was to (i) explore farmers' performance of SSE and participation in CSE, (ii) examine how SSE and CSE vary across gender, age, education, farming type, personal and family history of skin cancer, and skin type, and (iii) explore barriers to engagement with SSE and CSE. In doing so, this study will provide insights into the key barriers that must be addressed to facilitate and motivate farmers to engage with early skin cancer detection.

2 | MATERIALS AND METHODS

2.1 | Ethical approval

The study was approved by the University of Adelaide's School of Psychology Human Research Ethics Committee (HREC-2015-47).

2.2 | Study design

A cross-sectional, mixed-methods design was used to assess farmers' early skin cancer detection practices and explore barriers to engagement. Data were collected via paper-based surveys that included closed- and open-ended questions. Demographic information was collected to describe the sample and examine correlates of engagement with skin cancer detection. Data on a separate topic (skin cancer prevention behaviours), collected in the same survey, are reported elsewhere.[27]

2.3 | Participants

Farmers aged 18 years or over, who understood and spoke English, and who worked outdoors on a farm, livestock or pastoral enterprise were eligible to participate in the study. Farmers were recruited through Livestock SA (a membership-based organisation representing the interests of livestock farmers in South Australia). Livestock SA members ($N = 1653$) were informed about the study via email one month prior to paper-based surveys being mailed. Farmers ($n = 501$) returned completed paper surveys via reply-paid envelopes (response rate = 30.3%). All participants provided written informed consent via signed consent forms returned with their completed paper surveys. Three surveys that were completed together with a spouse were excluded from the analyses to reduce the potential impact of response biases.

2.4 | Measures

Farmers' demographic characteristics were assessed using 10 items. Information on predisposition to skin cancer was collected by assessing personal and family history of melanoma and non-melanoma skin cancers. Information on demographic characteristics, including gender, age, marital status, education level, South Australian region, and farm type was also collected. The Fitzpatrick skin phototype scale[28] was used to assess farmers' tendency to burn or tan when exposed to UVR from the sun.

Four items assessed farmers' engagement with skin cancer detection practices. Performance of SSE was assessed using two items originally described by the Melanoma Genetics Consortium (GenoMEL).[29] The first item assessed self-conducted SSE: how often do you examine your skin thoroughly for changes or signs of skin cancer? The second item assessed partner-assisted SSE: how often do you ask a family member (or close friend) to examine your skin thoroughly for changes

or signs of skin cancer? Responses options were daily, weekly, monthly, twice a year, yearly, less often, never, and I do not know. Another two items, adapted from the measure validated by Aitken et al.[30] assessed frequency of participation in CSE. The first item assessed routine CSE sought for preventive purposes: over the past 3 years has a doctor deliberately checked the skin on all or nearly all of your whole body? The second item assessed reactive CSE sought in response to changes in the skin: over the past 3 years have you gone to the doctor if you noticed any new spots or existing spots that changed colour, size or shape? Participants answered yes, no, or not applicable.[1]

Two open-ended questions were included to explore barriers to engaging with early skin cancer detection practices. These were: (i) describe what may make it difficult for you to examine your skin thoroughly for changes or signs of skin cancer, and (ii) describe what may make it difficult for you to go to the doctor if you notice any new spots or existing spots that have changed colour, size, or shape.

2.5 | Analysis

2.5.1 | Quantitative data

Quantitative data were analysed using IBM SPSS Statistics standard version 26.[31] Frequencies described farmers' engagement with SSE and CSE practices. Shapiro–Wilk tests demonstrated that the data were not normally distributed, therefore non-parametric tests were used to examine differences in detection practices across demographic variables. Mann–Whitney *U* tests were used to compare SSE between groups based on gender as these were measured dichotomously. Kruskal–Wallis *H* tests were used to compare SSE between groups based on age, education, personal and family history of skin cancer, farm type, and Fitzpatrick skin phototype because each of these independent variables consisted of more than two levels. Chi-square tests were used to examine differences in frequency of participation in CSE across gender, age, education, farm type, personal and family history of skin cancer, and Fitzpatrick skin phototype groups.

2.5.2 | Qualitative data

Responses to open-ended questions were analysed by CMEF and refined with input from KMG, using NVivo 11 Plus to help organise the data. Qualitative content analysis was used to categorise farmers' barriers to engaging with SSE and CSE. Content analysis was chosen because it is a descriptive approach that can be used to quantify the frequency with which words, themes, or concepts appear within a dataset.[32,33] This was considered to be an appropriate method of qualitative data analysis given that the collected data were short responses to open-ended survey questions. Rather than applying a prescriptive list of assumed codes or categories, in this study, a bottom-up, inductive approach was used. This meant that codes and categories were formed based on the content of farmers' responses (rather than previous research or theories), to ensure that they accurately reflected the experiences of farmers in this sample.

Responses to each of the open-ended questions were analysed separately and were initially coded descriptively according to the barrier reported. Throughout the analysis, subsequent responses were compared to previously coded text and were either allocated to an existing code or assigned a new one. When all text had been coded, codes were examined for similarities and differences in content. Those with similar content were grouped into categories to describe the key barriers reported by farmers.

3 | RESULTS

3.1 | Participant characteristics

A summary of participant's characteristics is provided in Table 1. They have been described in detail elsewhere.[27]

3.2 | Frequency of engagement with SSE and CSE and influences

In general, skin cancer detection behaviours were performed infrequently. Mean reported frequency of self-conducted SSE was 2.6 (where 0 = Never and 6 = Daily); 64.3% of farmers conducted SSE themselves twice a year or less, and a further 4.5% did not know how often they conducted SSE (Table 2). Mean reported frequency of partner-assisted SSE was lower at 1.7 (where 0 = Never and 6 = Daily); 84% reported partner-assisted SSE twice a year or less. Participation in CSE was also infrequent, with 40.1% of farmers reporting that they had not received a routine CSE in the past 3 years, and 29.4% reporting that they had not sought reactive CSE as soon as possible after noticing changes to their skin.

Analyses were undertaken to examine whether engagement with early skin cancer detection practices differed according to farmers' demographic characteristics, Fitzpatrick skin phototype, and personal or family history. Findings are presented in Tables 3–5 and described below.

3.2.1 | Self-conducted SSE

Self-conducted SSE varied significantly between age groups ($\chi^2(6) = 12.804$, $p = .046$); farmers aged 70–79 years (mean rank = 193.30) were significantly more likely than 40–49-year-old farmers (mean rank = 271.54) to perform SSE ($p = .033$).[2] Farmers' self-conducted SSE did not appear to be associated with their gender, level of education, farm type or Fitzpatrick skin type (all *p*'s > .05).

However, farmers' personal history of skin cancer did influence self-conduct of SSE ($\chi^2(2) = 30.212$, $p < .001$). Pairwise comparisons with Bonferroni corrections revealed that farmers with a personal history of skin cancer (mean rank = 193.41) conducted SSE significantly

TABLE 1 Participant characteristics.

Characteristic	*N* (%) (unless indicated otherwise)
Age (mean, *SD*)	56.42 (11.05) years
Age range	22–89 years
Gender	
Male	414 (83.1)
Female	57 (11.4)
Marital status	
Married or living with a partner	442 (88.8)
Separated/divorced/widowed	29 (5.8)
Never married	17 (3.4)
Highest education level	
Primary or high school	242 (48.6)
TAFE or trade school	149 (29.9)
University	100 (20.1)
Farm type	
Grain, sheep, or cattle	253 (50.8)
Sheep or cattle	175 (35.1)
Dairy or cattle	5 (1.0)
Horticulture	6 (1.2)
Poultry	1 (0.2)
Viticulture	8 (1.6)
Other	49 (9.8)
South Australian region	
Eyre Peninsula	58 (11.6)
Yorke Peninsula	24 (4.8)
Lower/Mid North	88 (17.7)
Far North	19 (3.8)
Murray Mallee	36 (7.2)
South East	144 (28.9)
Kangaroo Island	13 (2.6)
Adelaide Hills or Fleurieu Peninsula	109 (21.9)
Personal history of skin cancer	
Yes—melanoma	27 (5.4)
Yes—non-melanoma	118 (23.7)
No	347 (69.7)
I do not know	5 (1.0)
Family history of skin cancer	
Yes—melanoma	61 (12.2)
Yes—non-melanoma	170 (34.1)
No	213 (42.8)
I do not know	40 (8.0)
Fitzpatrick skin phototype	
Type I—always burn	35 (7.0)
Type II—usually burn	132 (26.5)
Type III—sometimes mild burn	184 (36.9)
Type IV—rarely burn	122 (24.5)
Type V—almost never burn, tan deeply	19 (3.8)
Type VI—almost never burn, deeply pigmented	2 (0.4)

(Continues)

TABLE 1 (Continued)

more often than those without a personal history of skin cancer (mean rank = 265.17; $p = .000$), irrespective of the type of skin cancer previously detected. There was no significant difference between farmers with a personal history of melanoma (mean rank = 170.63) or NMSC (mean rank = 198.67; $p = 1.000$).

Similarly, self-conducted SSE varied according to whether farmers had a family history of skin cancer ($\chi^2(2) = 12.400$, $p = .002$). Pairwise comparisons with Bonferroni corrections showed that farmers with a family history of skin cancer (mean rank = 218.15) self-conducted SSE significantly more often than those who did not have a family history of skin cancer (mean rank = 250.92; $p = .035$). Family history was important regardless of the type of skin cancer; no significant difference between farmers with a family history of melanoma (mean rank = 219.80) or NMSC (mean rank = 217.55) was found ($p = 1.000$).

3.2.2 | Partner-assisted SSE

Receipt of skin examination from a family member or friend differed according to gender. Male farmers (mean rank = 221.96) reported receiving a skin examination significantly more often than female farmers (mean rank = 263.50), $U = 8937.500$, $z = -2.258$, $p = .024$.

Personal history of skin cancer contributed significantly to variation in partner-assisted SSE among farmers ($\chi^2(2) = 6.677$, $p = .035$). Pairwise comparisons with Bonferroni corrections showed farmers with a personal history of skin cancer (mean rank = 215.04) received skin examination from a family member or friend significantly more often than those without a history of skin cancer (mean rank = 249.26; $p = .035$), irrespective of the type of skin cancer ($p = 1.000$). Family history of skin cancer also contributed to differences in receipt of SSE from a family member or friend ($\chi^2(2) = 7.861$, $p = .020$). Pairwise comparisons with Bonferroni corrections revealed significant differences in partner-assisted SSE between farmers with a family history of skin cancer (mean rank = 223.35) and those who did not know their family history (mean rank = 286.59) ($p = .015$). Further analyses showed that farmers with a family history of NMSC (mean rank = 216.60) received partner-assisted SSE significantly more often than for those who did not know their family history (mean rank = 286.59) ($p = .015$). Interestingly, there was no difference between farmers with a family history (mean rank = 223.35) and those without (mean rank = 232.95) ($p = 1.000$).

TABLE 2 Frequency of self-conducted SSE and partner-assisted SSE among farmers.

Behaviour	*N*	Daily	Weekly	Monthly	Twice A year	Yearly	Less often	Never	I do not know
Self-conducted SSE	490	3.5%	9.4%	18.4%	20.4%	14.5%	19.2%	10.2%	4.5%
Partner-assisted SSE	479	0.4%	2.1%	11.9%	20.9%	13.4%	20.9%	28.8%	1.7%

TABLE 3 Gender differences in self-conducted SSE and partner-assisted SSE among farmers (Mann–Whitney *U* test).[a]

	Gender				
	Male (mean rank)	Female (mean rank)	Mann–Whitney *U*	*Z*-value	*p*-value
Self-conducted SSE	232.85	225.86	11052.00	−.372	.710
Partner-assisted SSE	221.96	263.50	8937.50	−2.258	.024

[a]Scoring for SSE such that higher mean rank indicates that SSE was received less often.

TABLE 4 Differences in self-conducted SSE and partner-assisted SSE between groups of farmers based on age, education, personal and family history of skin cancer, farm type, and Fitzpatrick skin phototype category (Kruskal–Wallis *H* test).

	Age		Education		Personal history		Family history		Farm type		Fitzpatrick skin phototype	
	χ^2	*p*-value	χ^2	*p*-value	χ^2	*p*-value	χ^2	*p*-value	χ^2	*p*-value	χ^2	*p*-value
Self-conducted SSE	12.804	.046	1.895	.388	30.212	<.001	12.400	.002	7.216	.205	4.577	.470
Partner-assisted SSE	4.438	.618	1.339	.512	6.677	.035	7.861	.020	3.469	.628	5.679	.339

3.2.3 | Routine CSE

There was no significant difference between male (60.9%) and female farmers (52.6%) in participation in routine CSE in the past 3 years, $\chi^2(1) = 1.435$, $p = .231$. Differences in routine CSE between age groups approached significance ($p = .053$), with pairwise *z*-tests showing that 70–79-year-old farmers received routine CSE (75.6%) significantly more often than other age groups ($p = .02$). Personal history of skin cancer was also found to contribute to differences in CSE ($\chi^2(2) = 40.985$, $p = .000$). Pairwise *z*-tests indicated that those with a personal history of melanoma or NMSC were significantly more likely to have received a routine CSE (*p*'s < .05).

3.2.4 | Reactive CSE

There was no significant difference between the proportion of male (68.9%) and female farmers (64.2%) who reported visiting the doctor as soon as possible in response to changes in their skin ($p = .528$). However, there was significant variation between age groups ($\chi^2(6) = 20.901$, $p = .002$), with pairwise *z*-tests revealing that farmers aged 30–39 or 40–49 years were significantly less likely than those aged 60–69 or 70–79 years to have visited the doctor after noticing changes in their skin (*p*'s < .05). Reactive CSE also varied significantly according to whether farmers reported a personal history of skin cancer ($\chi^2(2) = 33.352$, $p = .000$). Pairwise *z*-tests showed a trend similar to that found for routine CSE; farmers with a personal history of skin cancer were significantly more likely to seek reactive CSE after noticing after changes in their skin (*p*'s < .05).

3.3 | Qualitative findings

Barriers to SSE and CSE are presented in Figure 1 (see Figures S1, S2 for coding trees). Representative quotes for each of the categories of barriers are reported in Table 6 (see Tables S1, S2 for definitions of categories and additional representative quotes). Barriers to SSE were organised into six categories relating to physical difficulties examining the skin ($n = 135$), difficulties identifying changes in the skin ($n = 35$), forgetfulness and creating habits ($n = 19$), time and energy ($n = 18$), no one else to examine skin ($n = 13$), and lack of motivation ($n = 7$). Inability to see the skin on all areas of the body was the most common barrier to SSE reported by farmers. One farmer noted: *'self-examination is difficult for back areas—a mirror doesn't always give a 3D perspective and what looks like a freckle could be a minor lump'* (participant 478, female, 80–89 years).

Farmers also reported difficulties identifying changes in the skin, both because changes are often slow and difficult to see and because they were unsure what to look for. One farmer stated, *'I am not 100% confident I would recognise subtle changes or signs of skin cancer'* (participant 65, male, 40–49 years).

Barriers to CSE were organised within five categories relating to accessibility ($n = 61$), time ($n = 47$), avoidance and complacency ($n = 14$), finding the right doctor ($n = 13$), and cost ($n = 7$). Accessibility was a significant barrier reported by farmers; both in terms of the

TABLE 5 Differences in CSE between groups of farmers based on gender, age, education, personal and family history of skin cancer, farm type, and Fitzpatrick skin phototype category (chi-square analysis).

	Routine CSE				Reactive CSE			
	Yes (%)	No (%)	χ^2	*p*-value	Yes (%)	No (%)	χ^2	*p*-value
Gender								
Male	60.9	39.1	1.435	.231	68.9	31.1	.487	.485
Female	52.6	47.4			64.2	35.8		
Age group								
20–29	42.8	57.1	12.417	.53	66.7	33.3	20.901	.002
30–39	46.4	53.6			46.2	53.8		
40–49	54.4	45.6			57.7	42.3		
50–59	54.9	45.0			63.9	36.1		
60–69	65.8	34.2			75.9	24.1		
70–79	75.6	24.4			81.4	18.6		
80–89	66.7	33.3			100.0	0.0		
Education level								
High school	59.2	40.8	.365	.833	66.0	34.0	2.604	.272
Trade or TAFE	58.2	41.8			66.4	33.6		
Uni or college	62.0	38.0			75.0	25.0		
Personal history								
Yes	82.6	17.4	45.526	<.001	86.7	13.3	33.383	<.001
No	51.0	49.0			59.4	40.6		
Do not know	20.0	80.00			60.0	40.0		
Family history								
Yes	65.6	34.4	7.727	.021	73.1	26.9	6.520	.038
No	56.7	43.3			65.2	34.8		
Do not know	45.0	55.0			54.1	45.9		
Farm type								
Grain, sheep, or cattle	58.8	41.2	7.518	.276	68.3	31.7	2.203	.900
Sheep or cattle	59.5	40.5			68.2	31.8		
Dairy or cattle	80.0	20.0			50.0	50.0		
Horticulture	66.7	33.3			50.0	50.0		
Poultry	100.0	-			100.0	-		
Viticulture	100.0	-			75.0	25.0		
Other	55.3	44.7			69.6	30.4		
Fitzpatrick skin phototype								
Type I— always burn	62.8	37.1	3.486	.626	74.3	25.7	4.783	.443
Type II—usually burn	64.9	35.1			73.0	27.0		
Type III—sometimes mild burn	59.1	40.9			67.1	32.9		
Type IV—rarely burn	56.3	43.7			61.2	38.8		
Type V—almost never burn, tan deeply	47.4	52.6			73.3	26.7		
Type VI—almost never burn, deeply pigmented	50.0	50.0			50.0	50.00		

ability to obtain an appointment with the local GP, who may only be available one day per week, and in terms of the travel to see a skin specialist. Time was another significant barrier, with many farmers expressing a reluctance to take time off work to visit the doctor. As one farmer stated: '*Being a farmer, [I] mostly always think there is something more important to do, and we hate appointments—then you have to keep to a time schedule*' (participant 118, male, 50–59 years).

Farmers also expressed difficulties finding a doctor they felt they could trust or who would take their concerns seriously. One farmer said: '*[It's] easy to go to doctor, but when I asked him to check for skin*

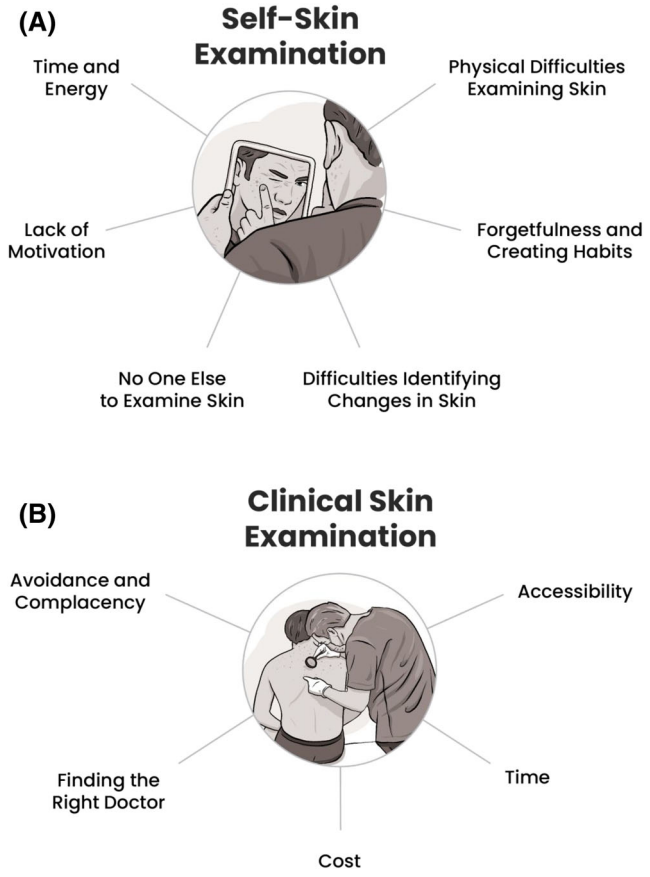

FIGURE 1 Key barriers to SSE (A) and CSE (B) from the perspective of Australian farmers.

cancers, he said just get my wife to check, and that's $68 today thanks!' (participant 258, male, 50–59 years).

There was overlap evident between each of the categories of barriers—it was common for farmers to avoid visiting the doctor for a CSE because of competing priorities around the farm or financial pressure.

4 | DISCUSSION

This paper sought to describe Australian farmers' early skin cancer detection behaviours and their barriers to engagement. In general, older farmers (aged 70+ years) were found to perform SSE and receive routine CSE more often than those who were younger. Farmers with a personal or family history of skin cancer also reported performing SSE and receiving routine CSE more often than those who did not have a history of skin cancer. Surprisingly, post-hoc analyses revealed no significant differences in skin cancer detection practices between farmers with a history of melanoma skin cancer and those with NMSC. This was unexpected because melanoma skin cancers are generally considered to be more serious,[3] and risk perception is a known determinant of health behaviour.[34] Farmers reported receiving routine CSE at a comparatively lower rate than has been reported elsewhere for Australian adults. Nearly 60% of farmers in the present study reported receiving routine CSE in the past 3 years, whereas Olsen et al.[35] found that 72.3% of adults aged 40–69 years had received routine CSE in the same timeframe. Farmers reported a range of barriers to performing SSE, including physical difficulties examining the skin, difficulties identifying changes in the skin, forgetfulness, and lack of motivation. They also reported major barriers to accessing CSE, which may explain their lower rates of participation in CSE. These included health services being located too far away, as well as being costly, and difficulties scheduling an appointment. When farmers were able to visit the doctor, they sometimes reported feeling unheard or dismissed, which had implications for future help-seeking.

It is worth noting that Australian farmers may face a 'double disadvantage' as they experience high levels of occupational solar UVR exposure in combination with reduced access to health services. Dobson et al.[36] suggest that exposure to health hazards that are less common in urban areas, combined with reduced access to health services, contributes to higher mortality rates in rural areas. This may certainly be the case for skin cancer mortality among farmers. It is possible that farmers are motivated to seek CSE but are unable to access skin cancer detection services. Many of the farmers who participated in the present study reported that they experience systemic barriers to visiting the GP in order to receive CSE, including long wait lists, doctors visiting infrequently, and cost. Concerningly, a key finding was that 29.4% of farmers did not see the doctor as soon as possible after noticing changes in their skin. Future studies could explore whether this is related to general levels of health literacy, attitudes towards help-seeking, or the systemic barriers that farmers face. Regardless, there is an urgent need to make clinical skin cancer detection more accessible to farmers, in addition to promoting help-seeking behaviours more generally, in this population.

The findings presented in this paper provide several important insights for health professionals and service providers. Physical difficulties examining the skin were the most commonly reported barrier to performing SSE. Another key barrier reported by farmers was difficulties identifying changes in their skin. These barriers could be overcome through the use of mobile phone photos to access difficult-to-see areas of the skin or artificial intelligence to detect concerning changes in the skin.[37] Apps could be an effective way to disseminate information to farmers about how to perform full-body SSE and identify changes in their skin. Alternatively, workshops that teach farmers (and their partners) how to perform SSE may help to improve their confidence in recognising changes in their skin and empower them to perform SSE by themselves or with a partner. This approach has been shown to increase performance of partner-assisted SSE and early detection of melanoma in patients with existing skin cancers[38] and could be adapted for farmers. Research among farmers has found that interacting with a supportive network and involving other people, helpes them to maintain and improve their well-being.[39] Building social aspects into skills training programs could be an effective way to overcome attitudinal barriers and engage farmers in learning about skin cancer detection. Another study evaluated the effectiveness of a skills training program delivered remotely to

TABLE 6 Barriers to SSE and CSE as reported by farmers.

Categories	*n*	%	Representative quotes
SSE[a]			
Physical difficulties examining the skin	135	59.5	'Can't see the areas that would most likely be affected' (participant 291, male, 50–59 years)
Difficulties identifying changes in the skin	35	15.4	'I am not 100% confident I would recognise subtle changes or signs of skin cancer' (participant 65, male, 40–49 years)
Forgetfulness and creating habits	19	8.4	I just don't think to look at parts not regularly exposed to sun' (participant 46, male, 50–59 years)
Time and energy	18	7.9	'Who has the time?' (participant 195, female, 40–49 years)
No one else to examine skin	13	5.7	'No family member or friend willing to assist' (participant 397, male, 70–79 years)
Lack of motivation	7	3.1	'Cannot be bothered' (participant 169, male, 40–49 years)
CSE[b]			
Accessibility	61	42.9	'Getting an appointment in a timely manner. Wait lists here can be over 6 weeks long (for non-urgent appointments)'. (Participant 17, female, 30–39 years)
Time	47	33.1	'Time is valuable and on an average our doctors run 1–2 hours behind so waiting is frustrating, and more often than not we cancel'. (Participant 265, male, 50–59 years)
Avoidance and complacency	14	9.9	'I never look for changes to spots … devil you know better than the one you didn't know' (participant 475, male, 80–89 years)
Finding the right doctor	13	9.2	'Doctors (from recent experience) can be dismissive, i.e., "I've seen much worse skin than yours".' (Participant 297, male, 40–49 years)
Cost	7	4.9	'Cost of appointments—money is very tight at times' (participant 119, female, 40–49 years)

[a]Responses to open-ended question: 'Describe what may make it difficult for you to examine your skin thoroughly for changes or signs of skin cancer'.
[b]Responses to open-ended question: 'Describe what may make it difficult for you to go to the doctor if you notice any new spots or existing sots that have changed colour, size or shape'.

melanoma survivors and their partners,[40] with promising findings. Those who completed the training experienced improved confidence in performing SSE and were more likely to perform SSE on difficult-to-see areas and find concerning moles in comparison to controls.[40] The real-world practical barriers that both farmers and clinicians face (many of which have been identified in this study) may be addressed through the delivery of remote training to teach SSE skills.

Efforts to improve SSE and CSE in farmers should not focus solely on the individual behaviours of farmers. The role of health professionals and service providers, and the health policy system they are operating in, should also be considered. Accessibility was identified by farmers as a significant barrier to receiving clinical examinations or visiting their doctor, in response to changes in the skin. Similarly, many of the barriers to SSE identified by farmers may be overcome by making skin cancer detection services more accessible to farmers. Chronic shortages of GPs in rural areas mean that accessibility is an ongoing issue, and creative and innovative approaches are urgently needed to overcome the barriers that prevent farmers from engaging in skin cancer detection behaviours. One response to the GP shortage has been to focus on multi-disciplinary approaches to skin cancer detection, with a particular focus on up-skilling nurses.[41] For example, the Skin Cancer Assessment Remote Service is a nurse-led initiative providing skin cancer screening, risk assessment, and patient education to those in remote locations in Western Australia. The initial pilot saw 54 patients screened in 4 days.[42] Other solutions could include funding low or no-cost mobile skin clinics to visit rural areas or agricultural field days where farmers could speak with a health professional and receive thorough skin examinations. There are also many telehealth and technological opportunities for people living in rural or remote areas.[41] The recent development of practice guidelines for teledermatology in Australia represents a real opportunity for better service provision to farmers who may be otherwise unable to access GPs or dermatologists in-person.[43]

Compounding the accessibility barriers described above, some farmers in the present study noted that finding the right doctor was another significant barrier to seeking CSE. In fact, some farmers reported that their concerns had been dismissed when they had sought CSE. Whilst rural GPs and health professionals are navigating their own complex working environments, it is important that they are appropriately responsive to farmers when they present for routine CSE or have concerns about their skin, given their increased occupational risk of skin cancer. Farmers are already reluctant to prioritise their health,[20] and it is disheartening for them to have given up valuable time on the farm; travelled significant distances to attend appointments; and/or waited for significant periods of time, only to be dismissed.

4.1 | Strengths and limitations

This study had several key strengths. Although farmers are notoriously difficult to reach and involve in research, this study included large sample size, providing weight to both the quantitative and qualitative findings. The findings facilitate comparisons between farmers and the general Australian population, highlighting behaviours that need to be addressed by policymakers and health professionals so that equitable health outcomes can be achieved. Notable, is the comparatively lower uptake of CSE among farmers than the general Australian population. Finally, the use of qualitative data analysis provides a richer understanding of the barriers to SSE and CSE among farmers, as well as insight into how they may be addressed.

Limitations of this study can and should be addressed in future research. Firstly, the study sample was limited to South Australian farmers, and many of the farmers who participated worked on mixed grain, sheep or cattle farms, or sheep and/or cattle properties. The findings should not be generalised to other types of farmers (e.g., those working on horticulture, viticulture, dairy or poultry farms) and future research should endeavour to recruit participants from other farm types to explore their perspectives. One-third (35.3%) of farmers in the present study reported that they received partner-assisted SSE at least twice a year or more. This finding should be interpreted with caution, given a disproportionate subsample of surveyed participants reported being married or living with a partner (88.8%), compared with national data (58.1%).[44] Partnered people are more able to access SSE by another person, and this is therefore likely to have inflated the reported rates of partner-assisted SSE in this study. Future research should seek a more balanced sample of participants when it comes to relationship status.

It is worth noting that this study did not examine farmers' skin cancer literacy, although this was raised by farmers who reported difficulties recognising or identifying changes in their skin. Farmers' knowledge about skin cancer and prior experience identifying concerning moles is likely to influence their capability and motivation to perform SSE and seek CSE in response to changes in their skin, as is suggested by the finding that farmers with a personal history of skin cancer engaged with skin cancer detection practices more often. Also, personal and family history of skin cancer can encompass a broad range of experiences, potentially impacting farmers' skin cancer detection behaviours in different ways. These nuances may not have been fully captured in the present study.

4.2 | Future research

Future research could expand on these findings by exploring farmers' perspectives on what could be done to make SSE and CSE easier for them and what would motivate them to make SSE and CSE a priority. In addition, future research could seek to examine farmers' skin cancer literacy and understanding of skin cancer detection practices, including current knowledge on performing SSE, identifying changes in their skin, and recommendations around routine and reactive CSE. It may also be worth exploring farmers' understanding of routine CSE in comparison to reactive CSE in response to an observed change in their skin, given the small proportion of farmers in the present study who followed up with their doctor after noticing changes in their change. This knowledge would also help to inform design and implementation of culturally appropriate behaviour change interventions to inform farmers about how to perform SSE, what to look for, and when to seek CSE. Interventions that aim to improve skin cancer health outcomes for farmers through education may include remotely delivered or nurse-led SSE skills training. CSE may be made more accessible through the use of mobile skin clinics, tents at agricultural field days, teledermatological practices, or by up-skilling nurses to conduct CSE. Broader efforts focused on changing farmers' attitudes around the importance of investing time in their health and well-being may also be beneficial. Evaluation of such approaches should be a priority for future research.

5 | CONCLUSIONS

This study describes the current early skin cancer detection practices of farmers, the barriers they experience to performing SSE and seeking CSE, and the many competing demands farmers manage in relation to their livelihood and health. Importantly, this study highlights that there is still a need to make clinical skin cancer detection more accessible to farmers, in addition to empowering them to confidently perform a self-skin examination and encouraging help-seeking behaviours in response to changes in their skin. Researchers are encouraged to use these findings to inform the development, implementation, and evaluation of culturally appropriate education and behaviour change interventions for farmers. Health professionals and policymakers may use these learnings to inform clinical practice and consider system changes to make CSE more accessible generally.

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CONFLICT OF INTEREST STATEMENT

The authors declare that they have no competing interests.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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ENDNOTES

[1] 'Not applicable' responses excluded from analyses.

[2] Scoring for SSE such that higher mean rank indicates that SSE was received less often.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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