

# final report

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## **Farm Biosecurity Attitudes and Practices: Factors Influencing the Sheep Industry**

### **National Survey of Sheep Producers and Livestock Agents**

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## **ABSTRACT**

This project comprised two nationally-representative surveys conducted in March 2011 using computer-assisted telephone interviewing. The first was a survey of 870 sheep producers with 100+ sheep exploring current sheep health management with a focus on producer biosecurity attitudes and practices and use of the national Sheep Health Statement (SHS).

The second was a survey of 300 livestock agents currently working with sheep producers investigating their use of the SHS and their influence on producers' sheep health management. Results indicated that SHS uptake was hindered by lack of awareness and knowledge of the SHS (40% were ignorant of it and its contents) and lack of enforcement across States. Investigation of the agent-producer relationship indicated that agents were highly trusted and had potential to influence producers' uptake of the SHS.

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## EXECUTIVE SUMMARY

### Background

These two nationally representative surveys comprise the first phase of a research project funded by MLA to investigate factors influencing farm biosecurity attitudes and practices in the sheep industry. The aim of the sheep producer survey was to explore current attitudes and practices towards sheep health management with a focus on producer biosecurity practices and use of the Sheep Health Statement (SHS) as the principal tool available nationally to support and protect producers from disease risks during the sales process. The agent survey was undertaken to investigate agents' attitudes and practices regarding the SHS and to investigate their relationship with producers and assess the degree of influence they may have on their animal health practices.

The objectives of the first phase research were:

- To determine the uptake and use of the National Sheep Health Statement as an on-farm biosecurity tool for managing the risk of disease and pest introduction.
- To identify any regional variation in responses and reasons for the variation to the responses.
- To identify any possible drivers to assist the use of the Sheep Health Statement, and similarly, to identify any social or practical barriers to its uptake that may be amenable to change or influence.
- To collect data considered representative of the sheep producer and livestock agent populations and to assemble a dataset of sufficient size to perform robust and reliable statistical analyses.

Ethics approval for this research was obtained from the University of Western Sydney Human Research Ethics Committee (HREC approval reference H8882).

### Methodology

Two questionnaires were developed and the survey interviews were conducted using a computer-assisted telephone interviewing (CATI) methodology in which the interviewer follows a script using a software application that is able to customise the interview based on the answers provided.

The producer questionnaire comprised 53 questions, and covered a range of issues, including details of buying/selling in the last two years (for purposes other than to slaughter), use of the SHS and perceived drivers and barriers to its use. A sampling frame was developed in consultation with industry experts to capture data from a nationally representative sample of sheep producers with 100+ sheep. A total of 870 interviews were conducted with producers identified as the main person responsible for animal health management decisions, from 1-18 March 2011. The survey response rate was 33%.

The agent survey comprised 35 questions, and covered a range of issues, such as details of operating environments, relationship with clients, perceived influence on clients with regard to sheep health management and use of the SHS, and perceived barriers and drivers to use of the SHS. An agent population was obtained from member agency contact details openly available on the Australian Livestock and Property Agents Association (ALPA) website. A total of 300 interviews were conducted with agents from 1-10 March 2011. The survey response rate was 44%.

The sample sizes and response rates for the two surveys were good and provide confidence that data are representative of producer and agent populations. Both samples were drawn from established and comprehensive databases and the use of CATI methodology and experienced interviewers provides additional strength; with standardised procedures for data collection and coding and high levels of interview completion. In addition the surveys were structured to optimise the methodology and questions were time-bounded and related to *recent* experience and *current* practice to reduce recall bias and improve data accuracy.

## Results

Descriptive analysis was conducted, for the whole sample and for the sample cross-tabulated by State and by Ovine Johne's Disease (OJD) prevalence area. In addition multivariate logistic regression analysis was conducted with both producer and agent data to investigate factors associated with uptake of the SHS.

Some key findings from the producer survey are listed below:

- More than half of producers operated closed flocks, in which no sheep are introduced, or partially-closed flocks, in which only rams are introduced.
- Two-thirds of producers buy from a single trusted vendor or small group of trusted vendors.
- The SHS, NVD, and agents were identified as the main ways to assure others of the health of sheep.
- Over half of producers used agents for ALL their purchasing, and around a quarter used agents for NONE of their purchasing.
- Three quarters of producers used agents for ALL their selling, less than 4% used agents for NONE of their selling.
- Around a quarter of producers had never heard of the SHS and 17% had heard of it but were not aware of any of its content, i.e. around 40% were ignorant of it.
- Use of the SHS was typically 'all or none' with, very roughly, half of producers using it all the time and half using it none of the time.
- The SHS was regarded favourably with 70% of producers who were aware of it reporting that it was an effective tool for disease management.
- Agents were regarded as influential in the use of the SHS, with most producers reporting they were willing to supply or request a SHS if their agent told them to.
- Stronger enforcement and education/awareness programs were identified most frequently as ways to encourage uptake of the SHS.
- Current on-farm management practices appeared to be high, especially for inspection, disease monitoring, and movement recording. Some hygiene/cleanliness practices were less widely employed.
- Correct knowledge of current OJD prevalence area was poor with accuracy ranging from 17% to 63%, and producers were highly confident that they were correct.

Key agent survey findings are listed below:

- As found in the producer survey, use of the SHS was generally 'all or nothing' with similar proportions of agents (40-50%) using the SHS ALL the time or NONE of the time.
- Agents had strong established and trusted relationships with producers and they believed they have a high degree of influence on producers. These findings were mirrored in the producer survey.
- Over half of the agents believed that the majority of their clients (>75%) relied solely on their judgment to purchase disease-free sheep.

- Agents advise producers on a range of issues, but mostly around correct completion of paperwork; the NVD and SHS.
- Around half of agents conduct more than half their sheep work in locations where the SHS is not mandatory.
- In relation to selling, agents identified the main drivers for uptake of the SHS as it being mandatory, achieving better prices, and increased buyer interest.
- In relation to purchasing, agents identified the main drivers for uptake of the SHS as providing protection from buying diseased sheep, providing useful information, and assurance.
- Main barriers to use of the SHS were reported as being a lack of mandatory requirement, apathy, ignorance/lack of awareness of the SHS, and lack of perceived benefits of its use.
- Agents were generally positive about the SHS; considering it effective, useful and necessary.
- At least half of agents reported that they encouraged producers to supply a SHS when selling and to request a SHS when purchasing
- Agents acknowledged their influence on producer uptake of the SHS and were able to identify ways to improve its uptake; however, some felt that this should not be their responsibility.

Analysis of the data indicated many differences between producers from different States and OJD prevalence areas. Statistical modelling identified the main factors associated with uptake of the SHS. These factors related to operating climate and attitudinal factors; specifically whether use of the SHS was mandatory or not, whether agents requested the SHS, producer confidence in accurate completion of the SHS, reliance on the OJD Assurance Based Credit (ABC) points system for guiding purchases, and perceived ability to decide on health status by direct inspection.

Analysis of livestock agents' uptake of the SHS indicated, similarly, that this was based on the jurisdiction in which the agent was based and the operating 'norm' in that location. Higher levels of SHS uptake were associated with higher proportions of work based in areas in which the SHS was mandated, use of the SHS irrespective of producer demand for it, and positive attitudes towards the SHS, such as it being useful and effective for managing disease risk.

Agents regarded the main barriers to producer uptake of the SHS as being a lack of mandatory requirement, general apathy, lack of awareness and knowledge of it, and a perceived lack of benefits to its use. Agents themselves were generally positive about the SHS and when asked how *they* could influence producers' uptake of the SHS suggestions were mostly around their promotion and endorsement of it, increasing awareness and improving education of it, and insisting/advocating its use.

### **Recommendations**

In conclusion, the main barriers to SHS uptake were around its implementation within State, i.e. whether it was mandatory, or not, and poor levels of awareness and knowledge of it. Those who used the SHS more tended to have more positive attitudes to it and identified more benefits in its use. If uptake of the SHS is to be improved the approach to its implementation needs to be harmonised to simplify the communication with the sheep industry, currently sheep producers receive mixed messages and this is likely to be weakening its uptake. In addition there is a clear and ongoing need to raise awareness of the SHS and its potential benefits to producers and the industry more widely.

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In terms of the current effectiveness of the SHS as an OJD risk management tool, the low levels of accuracy of producer self-reported current OJD prevalence area raise concern over the validity of information being provided in Category A (Prevalence Area) recording of the ABC score calculation on the SHS. Changes were made to some prevalence areas on 01 January 2011, two months before the surveys were conducted, and were thought to explain some of the confusion here, however further investigation did not support this as a major contributor. Given that accurate OJD prevalence area knowledge is patchy and that the ABC score forms the basis for the national approach to management of OJD it could be timely to conduct an audit of SHS data.

Data collected about agents, from both agents and producers, suggests that they are highly trusted and influential in relation to use of the SHS. It is possible that agents are an untapped resource in the industry's animal health and biosecurity system and that this (much smaller) group could be a potential focus for future SHS-related extension and promotion activities. Evidence provided in the current research indicates that agent advocacy of the SHS would have an exponential effect on producer uptake and that uptake of the SHS is significantly associated with more positive attitudes towards it, which should help to sustain uptake once established.

Follow-on, Phase Two, research is planned to investigate either one or two major findings from this research or to target gaps identified by this. As producer research here was based on those with more than 100+ sheep a notable gap is the animal health attitudes and practices of small producers and their uptake of the SHS. Also, since survey interviews were conducted here, initiatives around uptake of the SHS and the role of agents have begun in Tasmania. With baseline data available from the current project the effectiveness and wider translation of these initiatives could be assessed with further data collection targeted on this population.



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## Glossary

ABC score	-	Assurance Based Credit score. This is a system for calculating the risk that sheep have OJD. Point credits are assigned under four categories relating to regional level of OJD, flock testing, OJD vaccination, and risk assessment of groups within infected or suspect flocks by approved veterinarians. Higher scores indicate lower risk of OJD.
AHA		Animal Health Australia
ALPA	-	Australian Livestock and Property Agents Association
ANZIC	-	Australia and New Zealand Industry Classifications. Codes used for analysis of industry statistics in Australia and New Zealand.
CATI	-	Computer-assisted telephone interviewing. A telephone based interviewing technique in which the interviewer follows a script provided by a software application, and in which the software is able to customise the flow of questions based on answers provided.
LHPA	-	Livestock Health and Pest Authorities. Providers of livestock health services in New South Wales.
MLA	-	Meat and Livestock Australia
NVD	-	National Vendor Declaration. A declaration that accompanies stock movements in which the producer declares compliance with Livestock Production Assurance (LPA); the industry's food safety program. This enables information on stock history to be supplied through the supply chain to the end consumer.
OB	-	Ovine brucellosis. An infection of the reproductive organs of sheep caused by bacteria ( <i>Brucella ovis</i> ) that impacts flock fertility.
OJD	-	Ovine Johne's Disease. An incurable infectious wasting disease of sheep caused by bacteria ( <i>Mycobacterium paratuberculosis</i> )
OR	-	Odds ratio
SHS	-	Sheep Health Statement. A nationally agreed document used by vendors to declare the health status of sheep for a number of significant conditions.

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# 1. BACKGROUND

The Beale Review described a biosecurity continuum with post border security managed by a range of stakeholders including producers. The implementation of on-farm biosecurity measures is considered an effective means of managing the risks associated with the introduction of both endemic and emergency diseases. State and federal government are increasingly incorporating biosecurity practices as the basis for animal health policy and work with industry to develop tools to assist with implementation on farm. A limited local survey undertaken in regional Victoria<sup>1</sup> indicated that the Sheep Health Statement (SHS) as a biosecurity tool had low uptake, and also indicated the potential role of livestock agents as influencers of SHS completion.

In December 2010 Meat and Livestock Australia (MLA) approved the research project; Farm Biosecurity Attitudes and Practices: Factors Influencing the Sheep Industry. This project comprises two phases of research and the two surveys detailed in this report mark the work conducted as Phase One research. The first survey is a nationally representative survey of sheep producers and the second is a nationally representative survey of livestock agents currently working with sheep producers.

As mentioned above this project was driven by the findings of the DPI VIC study conducted in late 2009/early 2010, but it was also driven by interest and support from the National Ovine Johne's Disease (OJD) Management Committee and, directly from MLA. The survey of agents was also prompted by the DPI VIC study. This study was conducted in the context of a number of saleyards, and verbatim comments made by many of the producers suggested that livestock agents had a significant influence over their use of the SHS. Therefore it was felt sufficiently pertinent to capture the attitudes of agents in a similar timeframe to those of the producers.

## Objectives

The objectives of the research are

- To determine the uptake and use of the National Sheep Health Statement (SHS) as an on-farm biosecurity tool for managing the risk of disease and pest introduction.
- To identify any regional variation in responses and reasons for the variation to the responses.
- To identify any possible drivers to assist the use of the Sheep Health Statement, and similarly, to identify any social or practical barriers to its uptake that may be amenable to change or influence.
- To collect data considered representative of the sheep producer and livestock agent populations and to assemble a dataset of sufficient size to perform robust and reliable statistical analyses.

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<sup>1</sup> Victoria Department of Primary Industries (2009), Sheep Health Statement Survey

In meeting these objectives the sheep producer survey was to explore current attitudes and practices towards sheep health management with a focus on producer biosecurity and disease management practices and use of the SHS as the principal tool available nationally to support and protect producers from disease risks during sales/purchasing transactions and subsequent introduction of new sheep onto farm properties. A goal of the research was to identify potential barriers and drivers to the use of the SHS across the industry and to try to identify those that may be amenable to change through direct intervention; such as support, education, or extension; changes to process; such as management or implementation; or wider system change, such as policy or regulation.

The aim of the agent survey was similar to the producer survey, i.e. to investigate current attitudes and practices towards sheep health management and use of the SHS. In addition, it was to investigate, at a national level, the relationship between agents and producers; to gauge the degree of influence agents may have, the standing of agents with producers, and to estimate the extent to which agents do, or could, influence producers to use/complete the SHS.

## 2. METHODOLOGY

### Questionnaire development

The project commenced in early January and this dictated the time available for consultation and development activities, as the surveys needed to be fielded in early March to meet reporting deadlines in May/June 2011. Some initial scoping discussions had been held in advance of project commencement, but the timing of the development phase over the Christmas and New Year period did necessarily constrict consultation to a stakeholder group of primary industry representatives from five States (VIC, NSW, TAS, WA and SA), representatives from MLA and Animal Health Australia (AHA), and limited industry groups/association representatives, veterinarians, veterinary epidemiologists, agents and producers.

The questionnaire content was developed from mid-January to mid-February 2011, and was achieved through expedited iterative review with the stakeholder group and onwards to their contacts. This process resulted in a final panel review on 9 February at which both draft survey questionnaires were discussed and reviewed. As a result a number of reductions and changes were made to the surveys and these final draft versions were pilot tested with producers (n=21) and agents (n=16) on 23 February 2011.

During the development and consultation phase of the project a National Ethics Application Form (NEAF) was completed and submitted to the University of Western Sydney Human Research Ethics Committee (HREC). Ethics approval was subsequently granted by the HREC to enable the research to proceed (approval reference H8882).

Many considerations needed to be made during the questionnaire development process. In addition to selection and prioritisation of the content areas it was also necessary to decide how best to optimise the telephone interview approach. With regard to the methodology and the receiver (the producer/agent at the other end of the call) consideration was given to the perception of relevance of the content and flow from one area to another. It was also important to include consideration of the need to allow 'skips' for certain questions, whose content or logic would seem meaningless or irritating based on earlier responses given. A further consideration was to ensure that some topical/grass-roots issues were addressed in the content and to present questions that appear based in reality and pragmatism and to enable opportunities for respondents to speak frankly. The latter was achieved largely through a combination of limited open comment questions and the use of questions in which possible attitudes or positions (positive, negative, and occasionally controversial) were given in statements and respondents were asked to indicate their level of agreement or disagreement.

Finally, and importantly for both financial and data integrity reasons, it was necessary to try to keep the survey interviews to a reasonable length. This was achieved through prioritisation of content, and through design of survey items that minimised 'read out' of information and were efficient to administer, whilst also providing a balance of 'fixed' responses and open comment.

## Producer survey

### Questionnaire structure

The project consultation and development, as described earlier, led to the final version of the survey interview. A schematic of the questionnaire structure is provided in Figure 2.1. This shows an overview of the content areas and the flow of these across the interview. It also includes the number of questions in each section.

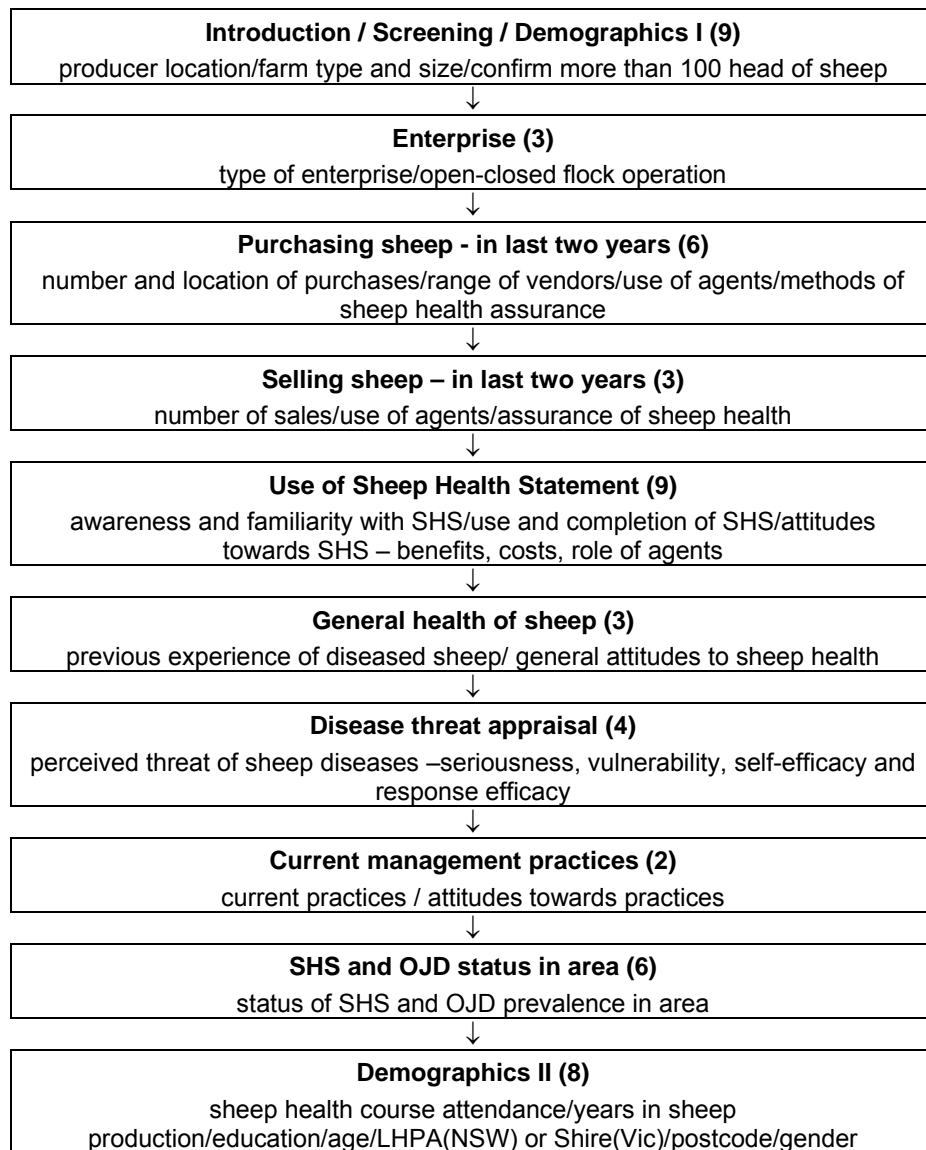


Figure 2.1. Producer survey schematic showing the interview flow, areas covered, and number of questions in each section in parenthesis.

The final version of the questionnaire comprised 53 questions, some with multiple parts. Seven questions were verbatim/open comment type questions and the remaining questions were either single response or 'read out response' questions. A full copy of the final questionnaire is included in Appendix 1a.



### ***Survey administration***

Data were collected using a computer-assisted telephone interviewing (CATI) methodology and this service was provided by a well-established market research company; Kaliber. Kaliber (and its predecessor company, Solutions Marketing) has extensive experience in the agriculture/livestock industry sector, and has conducted many market surveys for government agencies and industry associations.

CATI is a methodology that enables efficient telephone interviewing. It is a method in which the interviewer follows a script provided by a software application. The software is able to customise the flow of questions based on answers provided, as well as details of the respondent. The software is able to randomise the order of questions or response options to reduce potential biases due to ordering effects and also programme 'skips' (omit questions) in the interview based on answers provided to certain questions, such as those that would make a subsequent question not applicable. For example, in the producer survey here if producers were from NSW the software would prompt the interviewer to ask for Livestock Health and Pest Authority (LHPA) information later in the interview, similarly, if producers had not conducted any sheep sales in the previous two years the software would not display certain questions in the interview script related to sales' details to the interviewer.

### ***Sample***

The sample for the sheep producer survey was drawn from the Kaliber Rural Database. The Kaliber Rural Database is one of the most extensive and current rural databases available in Australia containing details of around 100,000 producers profiled by postcode, ANZSIC farm type, and farm size. The database resides within an IBM AS400 mainframe for which Kaliber has written customised enquiry software. Producer records were selected from the overall sample frame using an "nth number" random process within each strata.

The sample was designed to achieve a 90% confidence level with a margin of error of 2.5 – 3.0% for national level data, 5% - 10% for State level data and over 10% for regional level data. The sample was based on producer populations sourced from ABARE / MLA (2008 – 2009) and the approach was approved by MLA and advised by Kaliber; which has undertaken survey work previously for MLA with this population.

Table 2.1 details the sampling frame used for the survey. It includes details of the national sheep producer population (as defined by ABS for ANZIC) by ABARE region, the quotas taken in the sampling, the level of estimated sampling error within region, State, and overall. The approach taken is comparable to previous ABARE and industry studies conducted with this population.

<b>ABARE Region</b>	<b>Population</b>	<b>Quota</b>	<b>Error</b>
NSW: Far West	647	25	±16.1%
NSW: North West Slopes and Plains	1,474	36	±13.5%
NSW: Central West	2,771	65	±10.1%
NSW: Riverina	3,106	68	±9.9%
NSW: Tablelands (Northern Central and Southern)	2,217	54	±11.1%
NSW: Coastal	29	-	-
<b>New South Wales</b>	<b>10,244</b>	<b>248</b>	<b>±5.1%</b>
VIC: Mallee	493	30	±14.6%
VIC: Wimmera	1,040	50	±11.4%
VIC: Central North	1,640	53	±11.1%
VIC: Southern and Eastern Victoria	3,691	87	±8.7%
<b>Victoria</b>	<b>6,864</b>	<b>220</b>	<b>±5.5%</b>
QLD: West and South West	307	16	±20.1%
QLD: Central North	23	-	-
QLD: Charleville - Longreach	196	10	25.40%
QLD: Eastern Darling Downs	154	10	±25.2%
QLD: Darling Downs and Central Highlands of Queensland	306	16	±20.1%
<b>Queensland</b>	<b>986</b>	<b>52</b>	<b>±11.5%</b>
SA: North Pastoral	250	20	±17.7%
SA: Eyre Peninsula	725	30	±14.7%
SA: Murray Lands and Yorke Peninsula	2,316	60	±10.5%
SA: South East	1,682	40	±12.9%
<b>South Australia</b>	<b>4,973</b>	<b>150</b>	<b>±6.6%</b>
WA: Pilbara and the Central Pastoral	62	5	±35.6%
WA: Central and South Wheat Belt	3,106	75	±9.4%
WA: North and East Wheat Belt	1,090	40	±12.8%
WA: South West Coastal	942	30	±14.8%
<b>Western Australia</b>	<b>5,200</b>	<b>150</b>	<b>±6.6%</b>
TAS: Tasmania	653	50	±11.2
<b>Tasmania</b>	<b>653</b>	<b>50</b>	<b>±11.2%</b>
<b>TOTAL (N)</b>	<b>28,920</b>	<b>870</b>	<b>±2.8%</b>

Table 2.1. Sheep producer population details and the sample stratification frame.

### ***Sheep producer description and screening***

The initial portion of the agent survey included an introduction from the interviewer which sought consent from the producer to take part in the research. This section also included a number of demographic and enterprise-related questions that were used as screening questions to ensure that participants met the agreed target-description for the study. For the purposes of this study sheep producers were defined and included in this study if they were:

- a broad acre producer with more than 100 head of sheep (including lambs) currently, and
- of an enterprise type that could be classified under ANZIC, and
- someone who identified themselves as the person primarily responsible for animal health management decisions in the sheep enterprise.

With regard to the ANZIC classification, producers were classified as follows:

- a sheep specialist – at least 75% of farm income from sheep (wool/prime lambs) production;
- a grain/livestock grower - at least 25% of farm income from grain production and 25% of income from beef or sheep production;
- a beef/sheep producer - at least 25% of farm income from beef production and 25% of income from sheep production; and
- a hobby farmer (farm size less than 100ha)

In addition to these criteria for inclusion, a contacted producer also needed to fit within the allocated regional quota set in the sampling frame. If the contacted producer did not meet all these inclusion criteria he/she was thanked and the survey interview was terminated.

Hence, the selection protocol determined that the target producer description for this research comprised a nationally representative sample of broad acre producers with more than 100 head of sheep, who were in ANZIC classified enterprises and who were the persons primarily responsible for animal health management decisions in the sheep enterprise.

### ***Timelines***

The survey was piloted with 21 producers on 23 February. Survey interviews took place from 1-18 March 2011. In total 870 sheep producers were successfully interviewed.

## Agent survey

### Questionnaire structure

A schematic of the questionnaire structure is provided in Figure 2.2. This shows an overview of the content areas and the flow of these across the interview. It also includes the number of questions in each section.

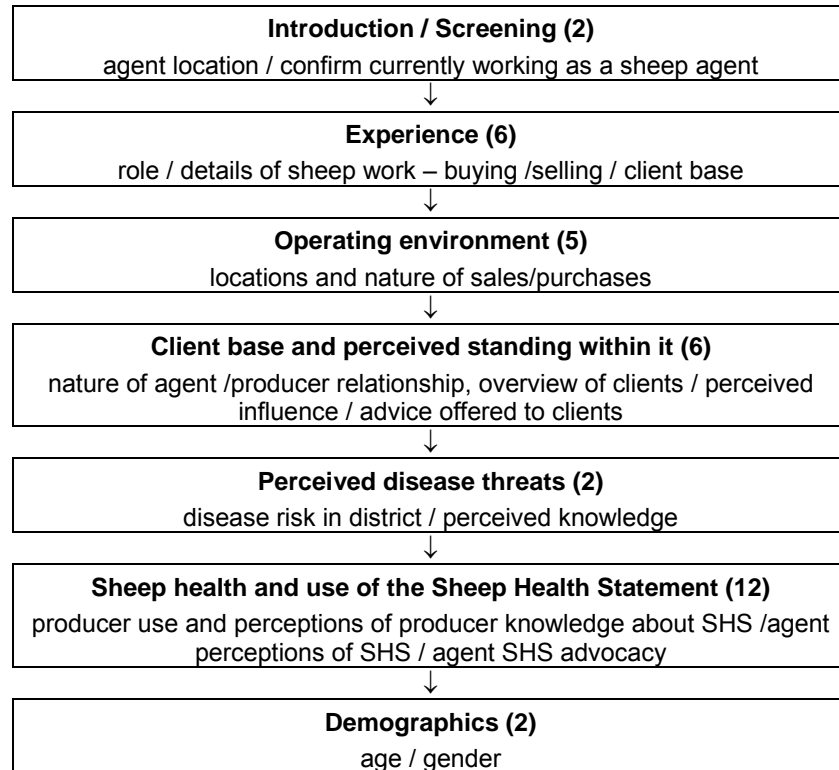


Figure 2.2. Agent survey schematic showing the interview flow, areas covered and number of questions in each section in parenthesis.

The final version of the questionnaire comprised 35 questions, some with multiple sections. A full copy of the questionnaire is included in Appendix 1b.

### Sample

The sample for the survey was derived from the online details of all livestock and property agents listed as members of the Australian Livestock and Property Agents Association (ALPA) on the open access member listings section of the ALPA website. Agent location, agency names, job titles and contact numbers were entered onto an excel spreadsheet. Individuals listed with roles or job titles that appeared to be exclusively property agent positions were not included in the spreadsheet as this group was not the target population for the study. Similarly, agents listed in the Northern Territory were not included as the research team was advised that this would not include agents working with sheep. In total 2030 agent details were recorded. The agent sample list was used to randomly select individuals for telephone contact.

### ***Agent description and screening***

The initial portion of the agent survey included an introduction from the interviewer which asked the contacted agent if he/she consented to take part in the telephone survey. This section also included two questions about the State/ Territory and ABARE region of the agent and included an initial screening question which asked if the contacted agent, in his/her current role, worked with sheep producers to buy or sell sheep. If this was confirmed, then the full survey interview was conducted, if the agent did not currently work with sheep producers he/she was thanked and the survey interview was terminated. Hence, the selection protocol determined that the target description for this research comprised a nationally representative sample of all ALPA-member livestock agents currently working with sheep.

### ***Timelines***

The survey was piloted with 16 agents on 23 February. Survey interviews took place from 1-10 March 2011. In total 300 sheep livestock agents were successfully interviewed.

## **Statistical analysis**

The SAS statistical program (© 2002-2003 SAS Institute Inc., Cary, NC, USA) was used for all statistical analyses reported in this report.

### ***Whole sample frequency data***

In the results sections of both the producer and agent surveys frequency data have been reported for the whole sample, for all questions, to enable an all-of-industry view across the entire survey content. These sections are supplemented with additional frequency tables and tables of verbatim comment transcripts in the appendices. In general the reporting of results follows the survey content structures, as shown in Figures 2.1 and 2.2.

### ***Analysis by State and OJD prevalence area (Producers only)***

In addition to whole sample frequency data the producer data have been cross-tabulated by State and by the verified OJD prevalence area of the producer to enable some top-level observations and comparisons to be made. In the main results section selected tables have been presented and discussed. These are supplemented by a more complete set of tables in Appendix 4 for State and Appendix 5 for OJD prevalence area.

Although producers were asked to indicate their OJD prevalence area in the survey this was not used to assign prevalence area to producers for the analysis. Instead, the relationship between producers and OJD prevalence area was verified using the following approach:

- For those in single prevalence area States, i.e. QLD, WA, producers were assigned a prevalence area based on their State.
- For those in single prevalence States with islands with difference prevalence area designations, i.e. SA/Kangaroo Island and TAS/Flinders Island, producers were assigned by a combination of State and postcode
- For those in VIC, prevalence area was assigned with a combination of State and Shire information.

- For those in NSW there was a multistage assignment of prevalence area; first, those in single prevalence area LHPAs were assigned to that prevalence. Those in multi-prevalence LHPAs were checked by postcode to see if their postcode area overlapped more than one prevalence area, and were assigned prevalence areas if they were clearly located within a prevalence area.

Discussion of differences based on cross-tabulations by State and OJD prevalence area are based entirely on these descriptive data and observed, relative differences between sub-groups only, therefore no statistically-based differences are intended or implied in this section of the report. Secondly, we did not apply weightings to the observed frequencies based on sample quota.

**Response “indicators”:** The producer survey comprised a number of multi-part questions, in which producers were given five response options, i.e. Q32, Q37, and Q38-43. Some of these questions were in a statement format, in which the producer was asked to indicate his/her level of agreement with a series of statements, and some had different formats but were delivered in a similar series with five response options. For reporting of the whole sample frequency data these questions have been shown mostly in graphical formats, with frequency tables provided in the appendix (Appendix 3). For cross-tabulated data this approach was not possible for each State and OJD prevalence area separately and therefore in the main text a simplified approach has been taken and data ‘indicators’ have been provided. These ‘indicators’ are a simple summation of the first two response options in the response set, e.g. “strongly agree” + “agree”, or “extremely” + “very”. These indicators give a single indication of responses at one end of the response set for each question. For example, in the statement-format questions they provided an indication of the general level of agreement with the statement, and for questions concerning disease risk they provide an indication of the proportion of producers who think it is most serious, most likely to affect them, etc. Full frequency tables are still provided in an appendix for all questions (Appendix 4 for State and Appendix 5 for OJD prevalence areas).

### ***Logistic regression analysis***

Producer and Agent data were subjected to ordinal logistic regression analyses to identify factors associated with the use of SHS.

**Outcome variable:** Ordinal variables representing uptake of the SHS by agents and producers were used as the outcome measures. Both the variables consisted of three categories and were derived from the questions about the proportion of the purchases and sales that included use of the SHS (questions 16 and 17 for the agent survey and questions 27 and 28 for the producer survey). Further details about these outcomes are presented in the results section of the report.

**Explanatory variables:** Many of the variables derived from questions in the agent and producer questionnaire were included as explanatory variables for the analyses. Further details about these variables are also presented in the results sections of the report.

**Model building approach:** Associations of explanatory variables with the outcome variables were evaluated using ordinal logistic regression analyses. Initially, descriptive and univariate

ordinal logistic regression analyses were conducted using the SAS UniLogistic macro<sup>2</sup> (Dhand, 2010) to make a preliminary evaluation of the associations between explanatory and outcome variables. The variables unconditionally associated with the outcomes at  $P < 0.25$  were tested for multicollinearity in pairs using Spearman rank correlation coefficient and Pearson chi-square test. Only one of the pair of collinear variables was selected for further multivariable analyses if substantial (Spearman rank correlation  $>0.8$ ), and significant (Pearson chi-square  $P < 0.05$ ) correlations were detected, the other variable being tested only by including in the final model. Similarly, variables with greater than 10% missing values were excluded from multivariate analyses initially, but later tested by adding to the final model. Multivariate ordinal logistic regression analyses were then conducted using a forward stepwise selection approach to further evaluate associations of multiple explanatory variables simultaneously after adjusting for one another. Variables with  $P < 0.05$  in the multivariate models were considered significant. Odds ratios (OR) and their 95% confidence intervals for the final models are presented in the report.

### ***Review and discussion boxes***

Producer survey data are presented in content heading sections for the whole sample frequency data and for analysis by State and OJD prevalence areas. At the end of each of these main results sections a short boxed section entitled 'review and discussion' is provided, summarising the key findings. These sections are written to be standalone, and therefore may be used to fast-track through the report if needed.

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<sup>2</sup> Dhand, NK (2011) UniLogistic: A SAS Macro for Descriptive and Univariable Logistic Regression Analyses, 35 (1): 1-15 (available: <http://www.jstatsoft.org/v35/c01>)

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### 3. PRODUCER SURVEY RESULTS

The results are presented in sections that reflect the structure of the survey in Figure 2.1; however, the demographics section has been brought forward as part of the initial sample description section.

#### Response rate

A total of 870 survey interviews were conducted between 23<sup>rd</sup> February and 18 March 2011. In total 2617 contacts were made with eligible producers (who met the target description as defined earlier). Of these 1747 refused to take part in the survey, giving a response rate of 33.2%. The mean interview length was 19 minutes.

#### Sample description: Demographics

##### *Whole sample frequency data*

The opening and closing demographics sections and enterprise sections of the survey were fairly extensive (20 questions). Breakdowns of data from these sections are shown below to provide a detailed overview of the sample composition. Many of these variables will be used for further statistical analysis of the data to investigate differences in attitudes and practices within the sample. Readers of this report are encouraged to identify and/or request further analyses that are of interest or relevance to their needs.

Of the 870 producers interviewed 796 were male (91.5%) and 74 were female (8.5%). A breakdown of the sample by age and by State is shown in Tables 3.1 and 3.2 respectively. More than 60% of producers were aged 45-64 and more than half (54%) were based in NSW and Victoria.

Age	Frequency	Percent
18-24	9	0.1
25-34	45	2.8
35-44	77	11.6
45-54	75	30.5
55-64	77	31.5
65 and over	16	23.6

Table 3.1. Sample breakdown by age.

State	Frequency	Percent
NSW	251	28.9
VIC	215	24.7
QLD	54	6.2
SA	153	17.6
WA	145	16.7
TAS	52	6.0

*Table 3.2. Sample breakdown by State*

As mentioned earlier, ANZIC classification was part of the selection process, Table 3.3 summarises the farm types of the sample based on the criteria listed earlier.

Farm type	Frequency	Percent
Grain/livestock	289	33.2
Beef and Sheep	218	25.1
Sheep	341	39.2
Hobby farm	22	2.5

*Table 3.3. Sample breakdown by farm type.*

Producers were asked how many sheep, including lambs, they had on their property currently, and Table 3.4 shows a breakdown of sheep numbers. The mean number of sheep across all producers was 3800, with a median of 2000; this indicates that there was a positively skewed distribution, with a number of producers having substantially more than 2000 sheep.

No. of sheep	Frequency	Percent
Up to 999	233	26.8
1000-1999	196	22.5
1999-3999	211	24.3
4000 and above	230	26.4

*Table 3.4. Sample breakdown by number of sheep.*

Producers were asked if they had attended any sheep health or animal biosecurity courses, workshops, or field days in the last five years. Just over half (53%) reported that they had received some training. They were then asked how many years they had been in sheep production. Results were normally distributed with the mean number of years being 35.5 and the median 35 years.

Producers were asked what their highest level of education was, these data are summarised in Table 3.5.

Education level	Frequency	Percent
Up to and including school certificate or equivalent	312	36.3
TAFE Trade Course	44	5.1
TAFE Certificate Level	68	7.9
Year 12/HSC/Leaving Certificate	248	28.9
Tertiary Graduate	145	16.9
Post Graduate	42	4.9
Missing	11	-

Table 3.5. Highest level of education achieved.

As can be seen from Table 3.5, around two thirds of producers (65%) had achieved Year 12/Leaving Certificate or School Certificate level of education.

A few further questions were asked at the end of the survey interview; LHPA for those in NSW and Shires for those in VIC, and postcodes for all producers. These data were used to verify producer OJD prevalence area as described earlier and will be used for statistical analysis.

#### **Analysis by State and OJD prevalence area**

Most of the sample demographics have been cross-tabulated by State and OJD prevalence area although few are shown below because there were very few noticeable differences observed in these sample characteristics. All cross-tabulation data tables are included in Appendix 4 and 5, for State and OJD prevalence area, respectively.

The number of sheep on properties is shown in Tables 3.6 and 3.7 below for State and OJD prevalence area, respectively.

	NSW	VIC	QLD	SA	WA	TAS
Up to 999	26.7	33.0	9.3	30.1	17.2	36.5
1000-1999	19.9	25.1	13.0	29.4	22.8	13.5
1999-3999	26.3	24.7	18.5	20.3	27.6	21.2
4000 and above	27.1	17.2	59.3	20.3	32.4	28.9
<b>Total (n)</b>	251	215	54	153	145	52

Table 3.6. Number of sheep on each property by State. (% of producers in various states).

	Low	Medium	High
Up to 999	25.0	25.4	30.3
1000-1999	22.0	21.0	25.5
1999-3999	20.9	26.5	27.9
4000 and above	32.1	27.2	16.4
<b>Total (n)</b>	364	291	208

Table 3.7. Number of sheep on each property by OJD prevalence area. (% of producers in different prevalence areas).

Data in Table 3.6 indicate that producers in this sample in QLD have the largest proportion of farms with more than 4000 sheep, almost 60% of those in the QLD sample in the study. Properties with smaller numbers of sheep tend to be concentrated in TAS, VIC and SA.

In terms of OJD prevalence areas, there is a clear reduction in the larger flock sizes in high prevalence areas, presumably due to the difference geographic locations/States in which these areas fall (NSW and VIC).

***Sample description: review and discussion***

Reviewing the sample description, most producers in the sample were male (91.5%) and more than half (54%) resided in NSW and VIC. More than 85% of producers were aged over 45, and the mean years of experience in sheep production was around 36 years. Clearly the producer sample is highly experienced, professional, and (presumably) successful in sheep production. It should also be born in mind that the sample was screened to comprise those producers who indicated that they were the 'primary person responsible for animal health management decisions in their sheep enterprise', and therefore it would be expected that this sample would be older and more experienced, in general.

Just over a third of the sample (36%) had School Certificate level education or below and just under a quarter (22%) were university graduates. Around a half of the sample had attended a workshop or field day on biosecurity or sheep health in the last five years and no differences were noted in course attendance levels between those residing in different prevalence areas, and only minor variations were noted between States.

The mean number of sheep held by producers was 3800, with a median of 2000, indicating that there was a clear skew in the distribution of sheep, with a number of producers in the sample having substantially more than 2000 sheep. In the producer sample larger flock sizes and farms sizes were found for producers based in QLD.

## Enterprise

### *Whole sample frequency data*

Producers were asked about the nature of their sheep enterprise and operation and these data are summarised in Tables 3.8 and 3.9, respectively

Enterprise type	Frequency	Percent
Wool	124	14.3
Meat	167	19.2
Both Wool and Meat	579	66.6

Table 3.8. Sample breakdown by enterprise type.

Operation type	Frequency	Percent
Stud	22	2.5
Commercial	747	85.9
Mixed Stud/Commercial	101	11.6

Table 3.9. Sample breakdown by operation type.

In addition, producers were asked how they operate their flock (open/closed flocks) to get an indication of the potential for exposure to disease/disease risk through introduction of sheep from other sources. Table 3.10 summarises these data.

Operation of flock	Frequency	Percent
As a closed flock – self-sustaining, with NO sheep introduced from external sources	113	13.0
As a partially closed flock – with only rams introduced	454	52.2
As an open flock – with new sheep introduced occasionally	172	19.8
As an open flock – with new sheep frequently introduced	131	15.1

Table 3.10. Operation of flock.

As can be seen from the data in Table 3.10, more than half of producers operate with partially-closed flocks, introducing only rams, and 13% report that they operate a completely closed flock.

### *Analysis by State and OJD prevalence area*

As before all data were cross-tabulated by State and OJD prevalence area, selected data are shown below and all cross-tabulated data are provided in Appendix 4 and 5.

Table 3.11 shows enterprise type by State and Table 3.12 shows operation type by State.

	<b>NSW</b>	<b>VIC</b>	<b>QLD</b>	<b>SA</b>	<b>WA</b>	<b>TAS</b>
Wool	15.1	10.2	40.7	12.4	11.7	11.5
Meat	18.7	28.8	11.1	15.0	10.3	26.9
Both Wool and Meat	66.1	60.9	48.2	72.6	77.9	61.5
<b>Total (n)</b>	251	215	54	153	145	52

Table 3.11. Enterprise type by State. (column percents).

	<b>NSW</b>	<b>VIC</b>	<b>QLD</b>	<b>SA</b>	<b>WA</b>	<b>TAS</b>
Stud	2.8	2.3	0.0	4.6	1.4	1.9
Commercial	86.1	87.4	90.7	84.3	86.2	76.9
Mixed Stud/Commercial	11.2	10.2	9.3	11.1	12.4	21.2
<b>Total (n)</b>	251	215	54	153	145	52

Table 3.12. Operation type by State. (column percents).

Data in Table 3.11 indicate that the highest proportion of wool-only enterprises are operated by producers in QLD, and the highest proportion of meat-only enterprises are operated by those in VIC and TAS. Mixed wool and meat enterprises tend to be focussed in SA and WA; although this is the more common type of operation overall in all States. From Table 3.12 it can be seen that there are few stud-only operations, but a higher proportion is based in SA compared to other States in our sample, and TAS has the highest proportion of mixed stud and commercial enterprises.

In terms of flock operation, Tables 2.13 and 2.14 show data broken down by State and OJD prevalence area, respectively.

	<b>NSW</b>	<b>VIC</b>	<b>QLD</b>	<b>SA</b>	<b>WA</b>	<b>TAS</b>
As a closed flock – self- sustaining, with NO sheep introduced from external sources	11.6	13.5	9.3	13.7	17.2	7.7
As a partially closed flock – with only rams introduced	51.8	44.7	48.2	59.5	57.2	53.9
As an open flock – with new sheep introduced occasionally	19.5	25.1	27.8	15.0	14.5	19.2
As an open flock – with new sheep frequently introduced	17.1	16.7	14.8	11.8	11.0	19.2
<b>Total (n)</b>	251	215	54	153	145	52

Table 3.13. Operation of flock by State. (column percents).

	Low	Medium	High
As a closed flock – self- sustaining, with NO sheep introduced from external sources	11.3	13.4	15.9
As a partially closed flock – with only rams introduced	55.2	51.6	47.6
As an open flock – with new sheep introduced occasionally	19.2	20.6	19.7
As an open flock – with new sheep frequently introduced	14.3	14.4	16.8
<b>Total (n)</b>	364	291	208

Table 3.14. Operation of flock by OJD prevalence area. (column percents).

Data in the preceding tables indicate that, operation of partially-closed flocks is the most common form of flock operation across all States. The operation of totally closed flocks is more frequently reported by producers in WA, and is seemingly slightly more frequently reported by those in higher OJD prevalence areas. At the opposite end of the spectrum, producers reporting that they operate open flocks where sheep are being introduced frequently are more likely to be in TAS and NSW and in high OJD prevalence areas.

#### ***Enterprise: review and discussion***

In this short section producers were asked about the nature of their sheep enterprises. In general, most were operating mixed wool and meat enterprises and were in commercial operations, and around half were operating partially-closed flocks, with only rams being introduced. Breakdowns by State indicated that certain enterprise and operation types were found in different concentrations in different States, e.g. wool-only operations in the QLD producers; however the majority, in all States, was operating commercial, wool and meat enterprises.

## Purchasing sheep

### *Whole sample frequency data*

Producers were asked how many times they had bought sheep and had taken them onto their property in the preceding two year period. The mean number of purchases onto property was 4.16 with a median of 2.0. Table 3.15 summarises these data.

Sheep purchases onto property (n)	Frequency	Percent
0	216	24.8
1	131	15.1
2	294	33.8
3	64	7.4
4	61	7.0
5-10	77	8.9
11-20	16	1.8
>20	10	1.1
Missing	1	-

*Table 3.15. Number of times producers had purchased sheep and taken then onto property in the preceding two years.*

As can be seen above, over a quarter of producers (24.8%) reported zero occasions of buying and taking sheep onto property in the preceding two years. These producers (n=216) were not asked the remaining questions in this 'purchasing sheep' section of the survey, and they are excluded from frequency calculations here, and in the supporting data tables in the appendices.

Producers were next asked about the number of times they had purchased sheep from each of three location types in the preceding two years; direct off-farm, from saleyards and from online auctions. Table 3.16 summarises these data. The mean number of purchases made off-farm was 1.5, from saleyards was 1.2, and from online auctions was 0.2.

No. sales	Direct off-farm		Saleyards		Online Auctions	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
None	368	42.7	671	77.8	811	94.1
Once	133	15.4	60	7.0	22	2.6
Twice	224	26.0	56	6.5	17	2.0
3 or more times	137	15.9	75	8.7	12	1.3
Missing	8	-	8	-	8	-

*Table 3.16. Number of times producers had purchased sheep from different types of locations in the preceding two years.*

Producers were asked if they generally tended to buy from the same vendor or a small group of vendors, and two thirds of the producers who were asked this question (66.9%; n=432) reported that they did generally buy from single or a small group of vendors, and a third



(33.1%; n=214) reported they didn't. Producers were then asked what their reasons were for buying from a single or small group of vendors. These data were recorded in a number of pre-coded subject-specific response categories (these were not read out) and those that did not fall into these categories were recorded verbatim and subsequently coded into new subject categories. Responses to this question are summarised in Figure 3.1 according to the frequency of comments received in each category. Producers could provide multiple responses to this question; hence the sum of the comments is not the same as the number of producers.

Why do you buy from a single, or small group of vendors?

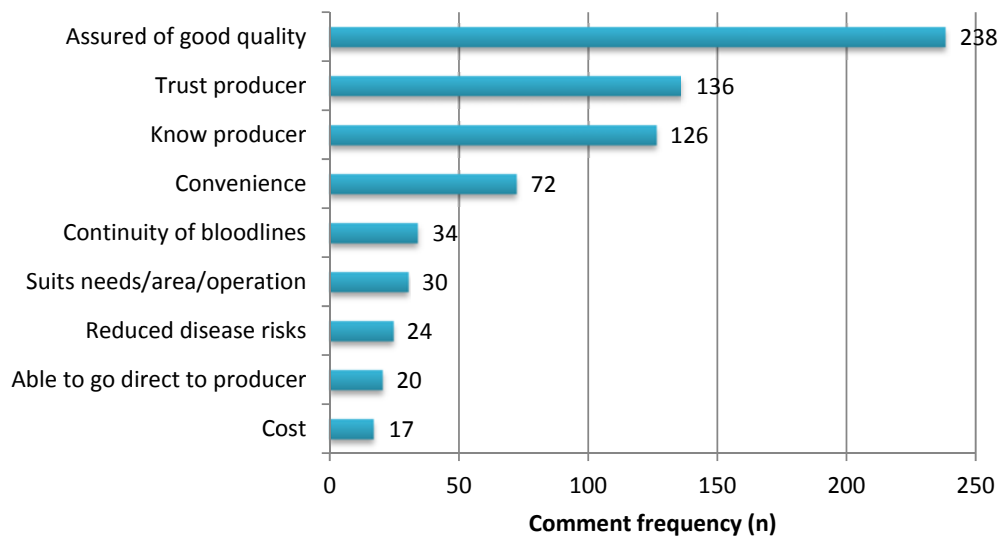


Figure 3.1. Summary of comments giving reasons for why producers buy from single or a small group of vendors.

As can be seen from Figure 3.1 quality assurance was the most frequently provided reason, followed by trust and knowledge of the producer.

Producers were asked what proportion of their purchases involved use of an agent. Although there was a spread of responses from 0 to 100 percent, most (91.3% of responses) were clustered around 0%, 50% and 100%, with 28.0%, 7.9% and 55.4% of producers providing these responses, respectively, i.e. just over a quarter of producers did not use agents for *any* of their sheep purchasing and over half used an agent for *all* their sheep purchasing over the preceding two years.

Finally in this section, producers were asked how they ensured that the sheep they bought were free of disease (Q22). As before, a set of pre-coded responses was used for this question with responses that were outside these areas being recorded verbatim and subsequently coded into additional subject-related categories. These data are presented in Figure 3.2; in addition the verbatim comments from this question have been included in Appendix 2a to provide further detail.

What do you do to ensure that the sheep you're buying don't have disease (such as lice, footrot, OJD, brucellosis or internal parasites)?

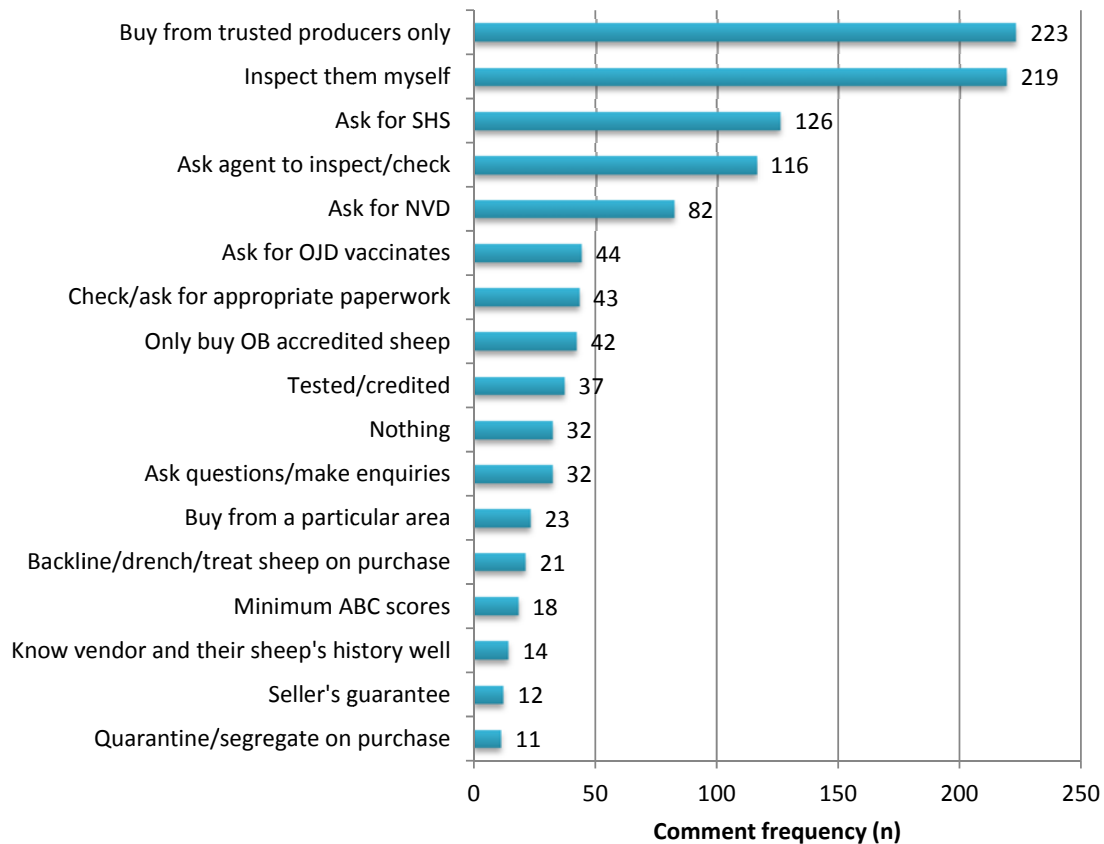


Figure 3.2. Summary of responses given by producers as ways they ensure that the sheep they're buying don't have disease.

As can be seen from Figure 3.2, most of the comments regarding how producers protect themselves from buying diseased sheep relate to either buying only from trusted producers or by inspecting the sheep for themselves. The next most frequent set of comments relate to using the SHS or asking the agent to inspect or check on their behalf. In the comment areas that follow there is clear reliance on paperwork, accreditation, vaccination and testing, and others are relying on immediate treatment (drenches etc) after purchase and quarantining on property to reduce disease risk and to protect their flocks.

#### **Analysis by State and OJD prevalence area**

As before, data were cross-tabulated by State and OJD prevalence area, and full sets of these tables are included in Appendix 4 and 5. Analysis by State indicated that producers in TAS were more likely, generally, to have made at least one purchase of sheep in the preceding two years that was taken onto their property.

Tables 3.17, 3.18, and 3.19 show the locations in which purchases were made in the last two years, by State.

	NSW	VIC	QLD	SA	WA	TAS
0	43.0	44.6	41.5	38.4	49.3	28.9
1	13.9	19.7	15.1	13.3	14.1	15.4
2	29.9	20.2	26.4	29.1	25.4	23.1
3 or more	13.2	15.5	17.0	19.2	11.3	32.7
<b>Total (n)</b>	251	213	53	151	142	52

Table 3.17. Number of times producers had purchased sheep from off farm, by State.

	NSW	VIC	QLD	SA	WA	TAS
0	80.9	66.7	96.2	80.1	78.9	80.8
1	8.0	10.8	1.9	6.0	4.2	1.9
2	4.0	8.9	1.9	6.6	9.9	3.9
3 or more	7.2	13.6	0.0	7.3	7.0	13.5
<b>Total (n)</b>	251	213	53	151	142	52

Table 3.18. Number of times producers had purchased sheep from saleyards, by State.

#### Q18 - from online auctions

	NSW	VIC	QLD	SA	WA	TAS
0	90.4	94.8	86.8	96.7	99.3	94.2
1	2.8	2.4	7.6	2.7	0.0	3.9
2	3.6	2.4	3.8	0.0	0.7	0.0
3 or more	3.2	0.5	1.9	0.7	0.0	1.9
<b>Total (n)</b>	251	213	53	151	142	52

Table 3.19. Number of times producers had purchased sheep from online auctions, by State.

Some differences in purchasing practices were noted between producers from different States. Those in TAS were more likely to buy off farm than those from other States, with around 70% of TAS producers in the sample reporting at least one off farm purchase in the last two years, compared to 50-60% of producers operating in other States. VIC producers were more likely to make purchases from saleyards than those from other States, with around a third reporting they had made at least one purchase, compared to around 20% in other States. QLD producers were the least likely to purchase through saleyards, with only around 4% having made saleyard purchases in the last two years. Few producers had purchased through online auctions; this appeared to be slightly more practised by producers in QLD, where around 13% reported at least one online auction purchase in the last two years.

In terms of who producers purchase from, Table 3.20 summarises the proportions of producers buying from single or a small group of vendors, by State.

	<b>NSW</b>	<b>VIC</b>	<b>QLD</b>	<b>SA</b>	<b>WA</b>	<b>TAS</b>
Yes	65.6	61.3	52.5	69.4	77.2	76.1
No	34.4	38.7	47.5	30.6	22.8	23.9
<b>Total (n)</b>	180	168	40	111	101	46

*Table 3.20. The proportions of producers who buy from a single or small group of vendors, by State.*

As already noted, it is generally common-practice to buy from a small group of trusted vendors, with this being practised by the majority of producers in most States. However, as data in Table 3.20 show, this is more predominant in WA and TAS and less so in QLD.

In the final question in this section, producers were asked to indicate the proportion of their purchases in the last two years, for which they had used an agent. Table 3.21 summarises these data by State.

<b>%</b>	<b>NSW</b>	<b>VIC</b>	<b>QLD</b>	<b>SA</b>	<b>WA</b>	<b>TAS</b>
0	32.8	22.0	47.5	20.7	33.7	19.6
1-49	2.8	4.2	0.0	4.5	1.0	2.2
50-99	15.6	12.5	17.5	15.3	6.9	17.4
100	48.9	61.3	35.0	59.5	58.4	60.9
<b>Total (n)</b>	180	168	40	111	101	46

*Table 3.21. The proportions of purchases in the last two years for which producers had used a livestock agent, by State.*

Again, differences in practice in QLD are clear, with fewer producers using agents for purchasing. Agents were used for all purchases (100%) by around 60% producers in VIC, TAS, SA and WA and by around half of producers in NSW. Interestingly, although use of agents for all purchases is high in many States, in WA and NSW up to a third of producers are not using agents for any of their purchases.

Only minor differences were noted for questions in this section by producers from different prevalence areas, and therefore none of these cross-tabulations are shown here. These data are available in Appendix 5.

***Purchasing sheep: discussion and review***

In this section producers were asked about their sheep purchasing activity and practices over the preceding two years. Around a quarter of the sample had not made any purchases that had resulted in sheep coming back onto their properties and they were excluded from the remaining questions in the section. In terms of locations of purchases, more producers bought direct off-farm than at saleyards and online auctions, although some differences were noted between producers in different States; QLD producers in the sample were least likely to buy through saleyards and were the most likely to buy using online auctions, VIC producers were most likely to have made purchases through saleyards.

Around two thirds of vendors reported that they generally tended to buy from a single vendor or a small group of trusted vendors. The most frequent reasons given for this were quality assurance, trust and knowledge of the vendor, and convenience. Only around half of producers in QLD indicated that they generally buy through a small group of vendors, compared to around three quarters of producers in WA and TAS. When asked how producers ensured that the sheep they buy are free from disease, the most frequent response was 'through buying from trusted producers only', although reduced disease risk was rarely given as the reason for buying from a small group of vendors in the earlier question. Other ways to ensure purchase of disease-free sheep were through inspecting them yourself, asking for the Sheep Health Statement (SHS), and asking the agent to inspect/check.

Producers were asked about the proportion of purchases for which they had used an agent. Just over a half of all producers used agents for ALL their purchases in the preceding two years, and around a quarter used agents for NONE of their purchases. Differences were noted between producers from different States, with agents being used ALL the time for around 60% of purchases by producers in TAS, WA, SA, and VIC and by only 35% of producers in QLD. In terms of the role agents may play in influencing producers' disease management practices and uptake of the SHS, there would clearly appear to be greater opportunities in States where agents are used more widely.

## Selling sheep

### *Whole sample frequency data*

In this section producers were asked a few questions about their sheep selling in the preceding two years. Producers were asked how many times they had sold sheep, other than for slaughter in the preceding two years. A third of producers (33.3%, n=290) had not sold sheep other than to slaughter in this time. Table 3.21 summarises these data.

<b>Sales not to slaughter (number of times)</b>	<b>Frequency</b>	<b>Percent</b>
0	290	33.3
1 to 4	264	30.3
5 to 8	127	14.6
>8	189	21.7

*Table 3.21. Number of times producers had sold sheep, other than to slaughter, in the preceding two years.*

The median number of times producers sold sheep, other than to slaughter, was 2.0 times and the mean was 9.6 times. As can be seen from the data in Table 3.21, more than three quarters of producers sold non-slaughter sheep fewer than eight times in this period, however, there was a positive skew in the distribution, with a long 'tail' in the data where some producers (around 5%) were selling 30 or more times.

As for the purchasing questions earlier, producers were asked what proportion of their sheep selling involved use of an agent. The 290 producers who did not sell sheep other than to slaughter, i.e. a zero response to the previous question, were excluded from this question. As before, for buying sheep, there was a spread of responses from 0 to 100 percent. However, three quarters of producers (75.0%) reported that they used agents for 100% of their sales, with most of the remainder reporting using agents for 50-99% of their sales. Only 4.5% reported using an agent for between 1-50% of sales, and 3.6% did not use an agent for any sales over the preceding two years.

Producers were asked to say how they provided assurance to others that their sheep were free from disease. These responses were given, as before, with a set of pre-coded (not read out) responses and others were recorded verbatim and coded subsequently. Figure 3.3 shows a summary of these responses.

How do you assure others<sup>3</sup> that your sheep are free from disease (such as lice, footrot, OJD, brucellosis or internal parasites)?

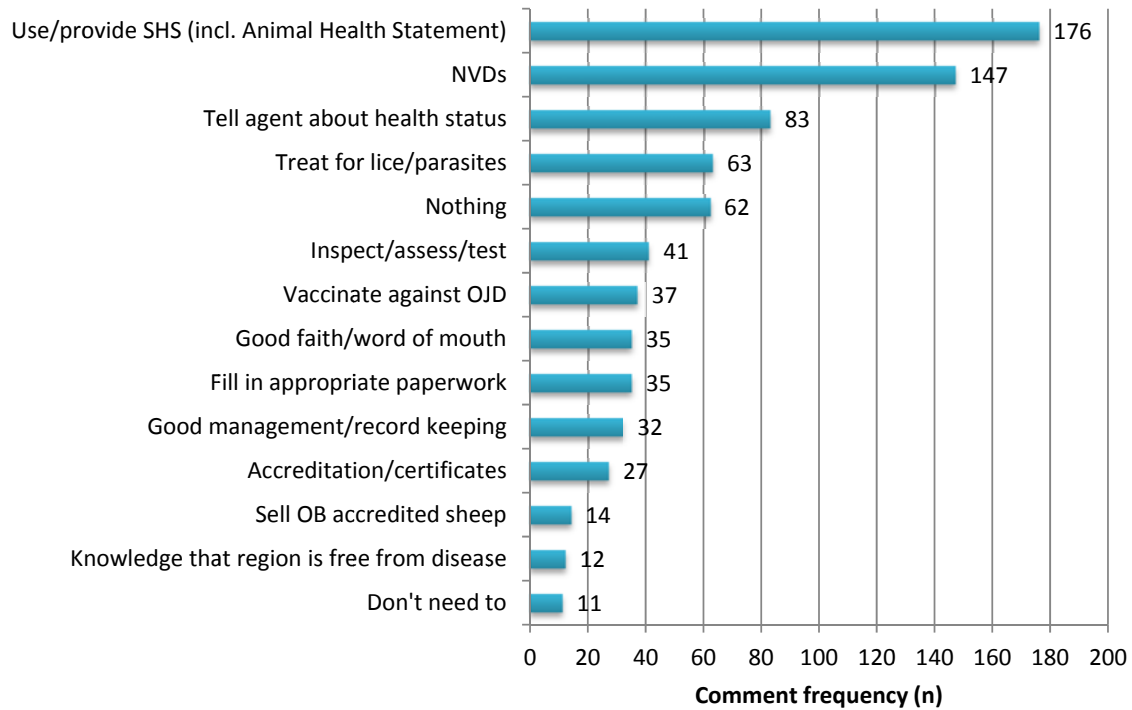


Figure 3.3. Responses given to the question how do you assure others<sup>3</sup> that your sheep are free from disease (such as lice, footrot, OJD, brucellosis or internal parasites)?

It is clear from Figure 3.3 that producers are relying on the SHS and NVD to provide assurance about the disease status of their sheep. Again, agents are regarded as important in providing assurance to buyers, as are tests, certificates, vaccinations and accreditations. There is evidence that some producers do nothing and don't feel there is a need to provide assurance, and others are relying on their reputation through word of mouth and good faith. The verbatim comments for this question have been included in Appendix 2b.

#### **Analysis by State and OJD prevalence area**

Data were tabulated by State and OJD prevalence area to look for differences in patterns of selling and use of agents for selling sheep. Table 3.22 summarises the pattern of selling by State.

<sup>3</sup> There was an error in the question wording. The actual wording was how do you assure 'vendors' that your sheep are free from disease and it should have been 'buyers'. It is likely that the context of this question in the interview (around selling) was such that this incorrect word did not get noticed (processed) and to our knowledge no respondents commented on this error.

Number of times	NSW	VIC	QLD	SA	WA	TAS
0	35.5	40.5	37.0	26.1	26.2	30.8
1 to 4	26.3	27.4	46.3	30.1	35.9	30.8
5 to 8	15.5	9.3	5.6	19.6	17.9	17.3
>8	22.7	22.8	11.1	24.2	20.0	21.2
<b>Total (n)</b>	251	215	54	153	145	52

Table 3.22 Number of times producers had sold sheep, other than to slaughter, in the preceding two years, by State. (column percents).

Data in Table 3.22 indicate a few differences in selling patterns across States, with producers in VIC and QLD being the most likely not to have sold sheep, other than to slaughter, in the last two years, and those in SA and WA being more likely to have sold non-slaughter sheep. Those in QLD were least likely to have made larger numbers of non-slaughter sales than those from other States.

Table 3.23 summarises the data regarding the use of agents for selling.

% of sale	NSW	VIC	QLD	SA	WA	TAS
0	3.7	3.9	2.9	3.5	3.7	2.8
1 - 49	4.2	1.6	5.9	3.6	4.6	5.6
51- 99	21.7	16.4	3.0	19.4	10.4	33.3
100	70.4	78.1	88.2	73.5	81.3	58.3
<b>Total (n)</b>	162	128	34	113	107	36

Table 3.23 Proportion of sales for which an agent was used, by State. (column percents).

Data in Table 3.23 show that a high proportion of producers used agents for selling their sheep for ALL their sales in the preceding two years. Producers in TAS were the least likely to use agents for ALL their sales. Relatively few producers used agents for less than 50% of their sales, and there were fewer observable differences between States than were highlighted previously for use of agents for purchasing sheep.

Again, there were some small differences in the responses of producers in different prevalence areas, but these have not been shown here. These tables can be found in Appendix 5.



***Selling sheep: review and discussion***

This was a short section in which producers were asked about their sales patterns and use of agents for selling sheep. A third of producers had not sold sheep, other than to slaughter, in the preceding two years and they were excluded for the remaining questions in this section. Agents were used more widely for selling sheep than purchasing sheep, with around 75% of producers reporting that they used agents for ALL their selling activity in the last two years. The use of agents for selling did not differ greatly between States (unlike use of agents for purchasing); although producers from TAS were slightly less likely to use agents for ALL their sales compared to producers from other States.

When producers were asked how they assured others of that their sheep were free of disease the most frequently given response was by using/providing the Sheep Health Statement (SHS). Other approaches included providing NVDs, telling the agent about the health status of the sheep, and by treating the sheep for lice and parasites. A number of producers (n=62) indicated that they do nothing.

## Use of the sheep health statement (SHS)

### *Whole sample frequency data*

In this section producers were asked about their familiarity with the SHS and their use of it over the preceding two year period.

Table 3.24 summarises the responses given to the question ‘How familiar are you with the national sheep health statement and its contents?’

<b>Familiarity with SHS</b>	<b>Frequency</b>	<b>Percent</b>
Very familiar, aware of all its content	269	30.9
Aware of the SHS, but not familiar with full contents	265	30.5
Aware of the SHS, but not familiar with any of its content	148	17.0
Have never heard of it	188	21.6

*Table 3.24. Familiarity with the SHS and its contents.*

As can be seen from the data in Table 3.24, around a fifth of producers (21.6%) reported that they had never heard of the SHS and a further 17% were aware of it but not familiar with any of its contents.

Those that had never heard of the SHS (n=188) were not asked the subsequent questions about the SHS in this section.

Producers were asked to report the proportion of their purchases that they had requested a fully completed SHS for, and the proportion of their sales they had supplied a fully completed SHS for. These questions were only asked of those producers who had reported earlier that they had made one or more sales and one or more purchases, respectively. Table 3.25 summarises these data.

<b>Proportion</b>	<b>Requested SHS for purchasing</b>		<b>Supplied SHS when selling</b>	
	<b>Frequency</b>	<b>Percent</b>	<b>Frequency</b>	<b>Percent</b>
0%	260	49.8	165	35.3
1-99%	40	7.7	55	11.8
100%	222	42.5	247	52.9
Not asked	348	-	403	-

*Table 3.25. Proportion of purchases and sales that included use of a completed SHS in the preceding two years.*

It is clear from the data in Table 3.25 that use of the SHS tends to be largely ‘all or nothing’ with, seemingly, more motivation to supply the SHS when selling than to request it when buying.

Producers were then asked a series of open questions asking them about buying and selling situations in which they don’t complete a SHS, parts of the SHS they tend to skip if they

don't always fully complete the SHS, and what parts of the SHS they find most useful. These data are summarised in Figures 2.4, 2.5, and 2.6, respectively.

In what buying or selling situations do you not complete or request an SHS?

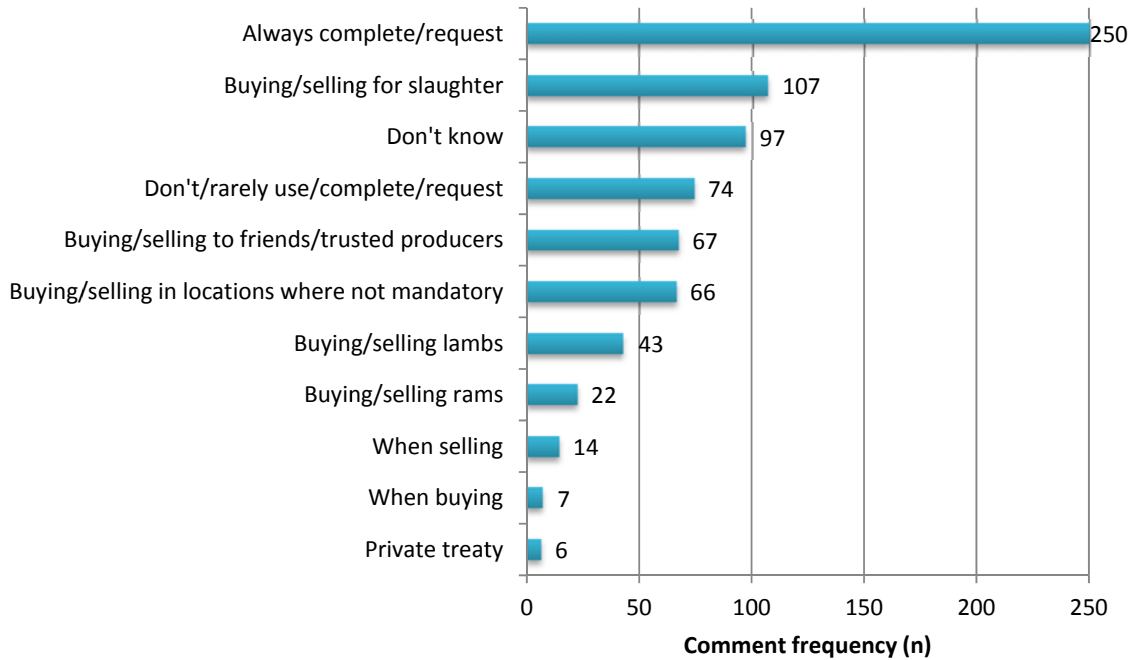


Figure 3.4. When producers report not completing/requesting the SHS?

Data in Figure 3.4 suggest that although many producers always complete/request the SHS, the times when they are most likely not to complete or request it are when buying/selling for slaughter, when dealing with friends or trusted producers, and when undertaking transactions in locations where the SHS is not mandatory or exempt. Interestingly, 97 producers report that they don't know of particular occasions when they don't complete / request the SHS. Possibly some of these respondents may be those who don't / rarely use the SHS, and this can be investigated further.

If you don't always fully complete the SHS, what parts do you tend to skip?

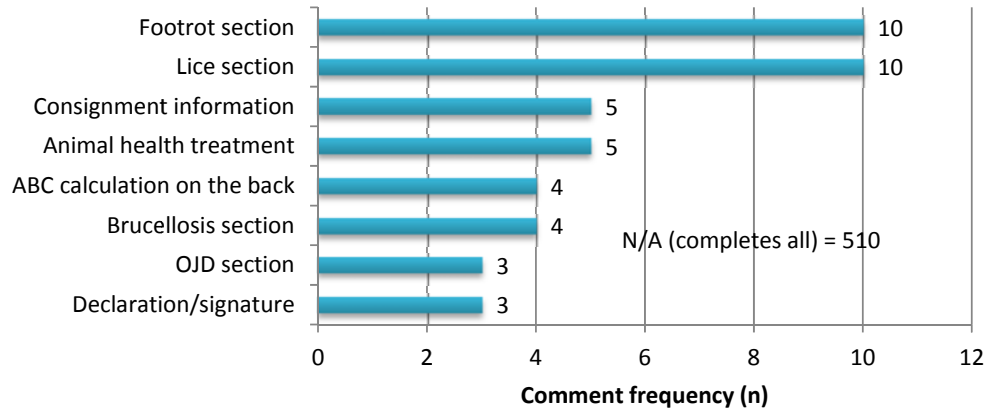


Figure 3.5. The parts of the SHS producers skip if they don't fully complete the SHS.

Data presented in Figure 3.5 show that completion of the SHS, like use of the SHS, would appear to be 'all or none' with very few producers indicating that they tend to skip sections of it and that they are more likely either to complete it fully or not complete it at all.

What parts of the SHS do you find most useful?

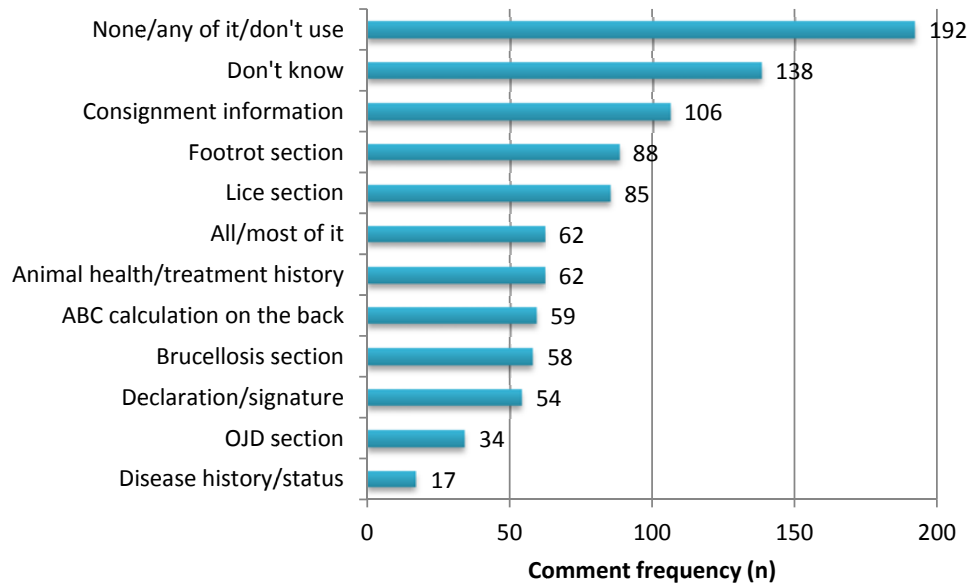


Figure 3.6. The parts of the SHS producers find most useful.

Although a large number of producers claim to find none of the SHS useful, or don't know, those who provided a positive response indicated that the consignment, footrot and lice sections were the most useful. However, OJD information on the SHS is likely to be regarded as equally useful to these other sections, as in Figure 3.6 the ABC calculation and the OJD section are listed separately but if combined they would be similarly rated.

Investigation of regional differences to this question suggested that producers in NSW and SA were more likely to express interest in specific parts of the SHS overall, probably reflecting the generally greater level of uptake in these States; similar proportions expressed that the consignment information (18%), footrot section (15%), and brucellosis section (10%) were useful. Producers in TAS and SA were more likely to be interested in the declaration / signature (9%), and SA producers were more likely to find the lice section useful (16%).

The next question in this section was a long multi-part question in which producers were given 20 statements regarding the SHS and were asked to give an indication of their level of agreement/disagreement with each statement using a 5-point (Likert) scale response set. Again, those producers who had never heard of the SHS were not asked these questions (n=188). Data from this question are presented below in two figures (Figure 3.7 and 3.8) to enable clearer presentation in the report. Data tables of responses to these questions are included in Appendix 3a.

What is your level of agreement with the following statements about possible attitudes to the SHS?

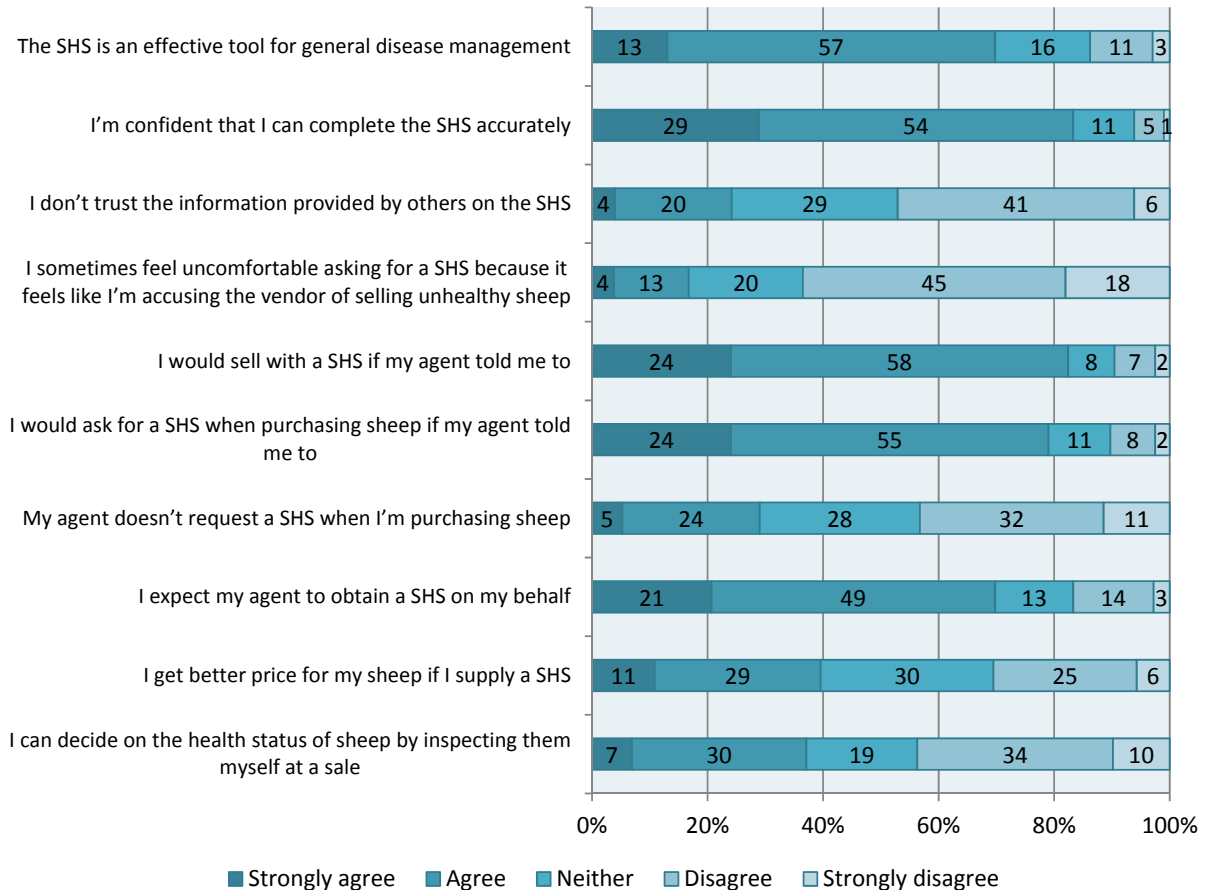


Figure 3.7. Level of agreement with a number of statements regarding the SHS and the role of agents.

Data in Figure 3.7 help provide insight into attitudes towards the SHS and its use. Producers appear, in general, to be in agreement that the SHS is an effective tool for disease management (70% agree) and they appear to feel confident that they are able to complete it accurately (84% agree). However, a quarter of producers feel that they don't necessarily trust the information provided by others on the SHS. The influence of agents is evident in the centre of Figure 3.7 with more than 80% of producers agreeing that they would sell or purchase with a SHS is their agent told them to, and it is clear that most (70%) expect their agent to obtain a SHS on their behalf. Around 43% of producers indicate that their agent generally requests a SHS for them when they purchase sheep. There appears to be fairly high degrees of uncertainty regarding whether supplying an SHS increases the prices achieved when selling, with 40% agreeing and 31% disagreeing. Similarly, there is some split in opinion about whether the health of sheep can be decided by direct inspection by the producer, with 37% agreeing and 44% disagreeing.

Figure 3.8 presents the remaining statements.

What is your level of agreement with the following statements about possible attitudes to the SHS?

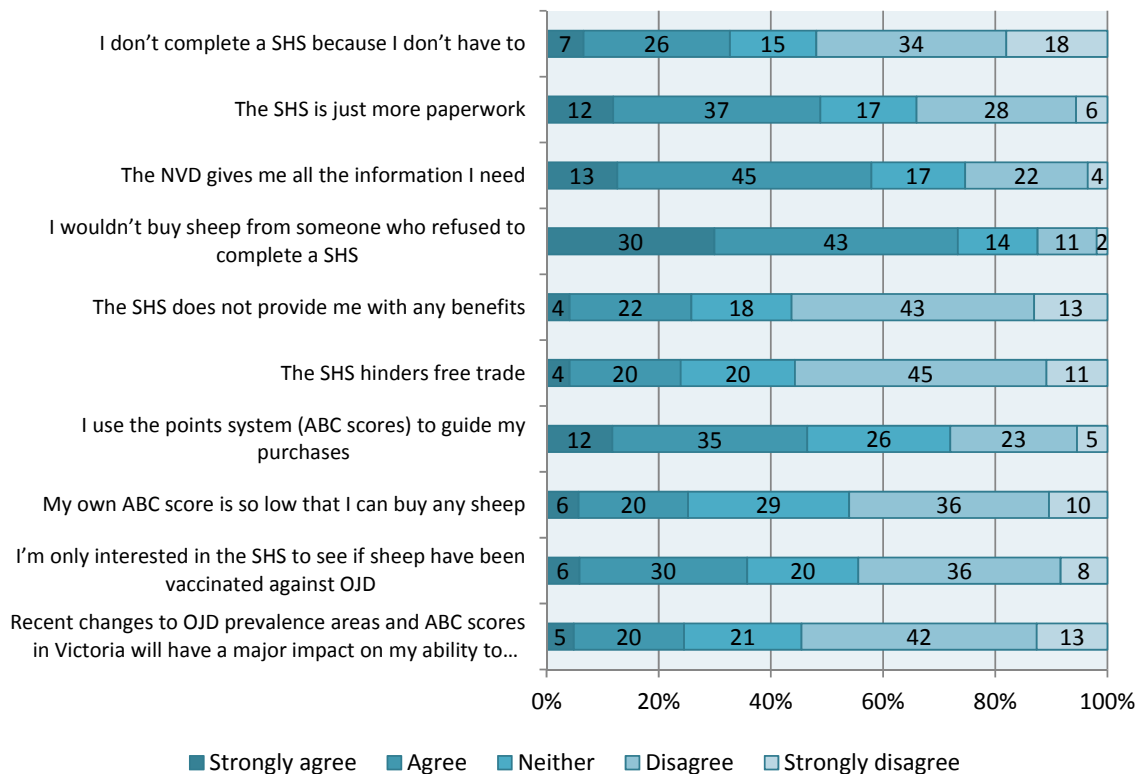


Figure 3.8. Level of agreement regarding a range of statements about the SHS.

In this section highest levels of agreement are noted for the statements that the NVD gives all the information the producer needs (58% agree) and that producers wouldn't buy from someone who refused to complete a SHS (73%). A number of the statements resulted in high levels of disagreement, specifically, that the SHS provides no benefits (56% disagree), that the SHS hinders free trade (56% disagree), and that changes to OJD prevalence areas

and ABC scores would have a major impact on the producer's ability to trade (55% disagree). Although the majority of producers disagree with these statements it is worth noting that around a quarter agree. Also, around half (49%) agree with the statement that the SHS is just more paperwork and a third (33%) report that they don't complete the SHS because they don't have to.

It would be expected that there would be geographical, and other, differences in attitudes between producers and these will be investigated using further statistical analysis later in the report.

Producers were asked if they knew what their current ABC score is. Table 3.26 presents the data for this question.

<b>Know current ABC score...</b>	<b>Frequency</b>	<b>Percent</b>
With certainty	208	30.5
Probably	121	17.7
Unsure	126	18.5
Probably not	45	6.6
Definitely not	105	15.4
Don't know what this is	77	11.3
Missing (not asked/never heard of SHS)	188	-

*Table 3.26. Producers' knowledge of their ABC scores; answers to the question 'Do you know what your current ABC score is?'*

Just under half of producers reported that they knew their ABC score with certainty or probably and the remainder were unsure or were certain that they didn't know. A further 188 producers were not asked this question because they reported earlier in the interview that they had never heard of the SHS, and therefore it is possible to estimate that just under two thirds of the full sample (approximately 62%) would not know their ABC score.

In the final question in this section producers were asked what they think would encourage better use of the SHS. This question was asked as an open question, all responses were coded verbatim (there were no pre-coded responses) and these comments were subsequently content-coded. Again, the 188 producers who had not heard of the SHS in the earlier question were excluded. Figure 3.9 summarises the most frequently given responses to this question. This question generated the most expansive comments in the survey and the full set of verbatim comments is included in Appendix 2c.

## What do you think would encourage better use of the SHS?



Figure 3.9. Coded responses to the question 'What do you think would encourage better use of the SHS?'

As can be seen from the data in Figure 3.9, a large number of producers felt they didn't know what would encourage better use of the SHS, it may be that many of these producers were those who had earlier reported that they were aware of the SHS but were not familiar with any of its contents, and this can be explored further. When the number of 'don't know' comments are combined with the number of excluded producers, this approximates to around half the sample, therefore, the comments data shown in Figure 3.9 are from the remaining half of the producers in the sample only.

The two most frequently made comments were that stricter enforcement or regulation and an educational/awareness program would help to encourage better use of the SHS. Further implementation/policy issues were also picked up in comments suggesting that more attention from authorities, along with more testing and inspecting and greater interstate co-operation would encourage better use of the SHS. Additional extension-type comments were made, such as suggesting that examples and explanations would help as well as further simplification of its use and application. A number of suggestions that it should be combined with the NVD were also made.

Finally, some producers identified the role of agents in encouraging better use of the SHS, suggesting that they could be more vigilant and directly involved in ensuring the SHS was included in transactions.

As indicated earlier, all verbatim comments were recorded for this question, unlike others that had some pre-coded responses too. These are in Appendix 2c and readers are encouraged to take a look through these, as they provide a direct, more detailed and candid indication of producers' views nationally.



### **Analysis by State and OJD prevalence area**

This was a lengthy section in the survey interview and covered a wide range of areas focussing on use of the SHS and factors that may encourage or restrict its use. As before, data have been cross-tabulated by both State and by OJD prevalence area to investigate differences in the data. All supporting tables are included in Appendix 4 and 5.

At the start of this section producers were asked about their general level of awareness of the SHS and its contents, Tables 3.27 and 3.28 summarise these data by State and by OJD prevalence area, respectively.

	<b>NSW</b>	<b>VIC</b>	<b>QLD</b>	<b>SA</b>	<b>WA</b>	<b>TAS</b>
Very familiar, aware of all its content	39.0	21.9	24.1	53.6	11.0	25.0
Aware of the SHS, but not familiar with full contents	33.9	30.7	16.7	33.3	24.1	36.5
Aware of the SHS, but not familiar with any of its content	12.8	20.5	25.9	8.5	25.5	15.4
Have never heard of it	14.3	27.0	33.3	4.6	39.3	23.1
<b>Total (n)</b>	251	215	54	153	145	52

*Table 3.27. Familiarity with the SHS and its contents, by State. (column percents).*

	<b>Low</b>	<b>Medium</b>	<b>High</b>
Very familiar, aware of all its content	45.6	19.9	20.2
Aware of the SHS, but not familiar with full contents	30.8	30.2	30.3
Aware of the SHS, but not familiar with any of its content	11.3	20.6	22.6
Have never heard of it	12.4	29.2	26.9
<b>Total (n)</b>	364	291	208

*Table 3.28. Familiarity with the SHS and its contents, by OJD prevalence area (column percents).*

Data in Tables 3.27 and 3.28 indicate that there is a wide variation in awareness and familiarity with the SHS across States and OJD prevalence areas. Those in SA and NSW have the highest levels of familiarity with the SHS, and more than a third of producers in QLD and WA report that they have never heard of the SHS. Just under half of producers in VIC report either never having heard of the SHS or being aware of it, but not familiar with any of its content. The equivalent proportions in QLD and WA are 59% and 65%, respectively. Possibly more concerning is that almost half of producers in high OJD prevalence areas (49.5%) report that they are either aware, but not familiar with any of the SHS contents or that they have never heard of the SHS.

In the second and third questions in this section producers were asked to indicate the proportion of purchases and sales that were accompanied by a SHS. Note; this and subsequent questions were not asked to those producers who reported having never heard of the SHS (n=188), and therefore, the percentages that are presented reflect the population of producers who are 'potential' users of the SHS, but these percentages understate the situation regarding the use of the SHS in the producer population as a whole. In addition,

only those who indicated that they purchased sheep (onto property) or sold sheep (other than to slaughter) at least once in the last two years were included in these questions.

Tables 3.29 and 3.30 summarise, across States, the proportion of purchases and sales in the last two years for which a SHS was requested or supplied, respectively.

	NSW	VIC	QLD	SA	WA	TAS
0%	36.3	55.5	78.6	37.6	76.6	55.6
1-99%	5.1	4.7	0.0	3.7	4.7	13.9
100%	58.6	39.8	21.4	58.7	18.8	30.6
<b>Total (n)</b>	157	128	28	109	64	36

Table 3.29. Proportion of purchases for which producers requested a fully completed SHS, by State. (column percents)

	NSW	VIC	QLD	SA	WA	TAS
0%	25.0	45.0	59.1	23.4	46.3	51.6
1-99%	13.6	8.0	9.1	1.9	11.9	9.7
100%	61.4	47.0	31.8	74.8	41.8	38.7
<b>Total (n)</b>	140	100	22	107	67	31

Table 3.30. Proportion of sales for which producers supplied a fully completed SHS, by State. (column percents)

Data in Tables 3.29 and 3.30 show that those in NSW and SA are the most likely to request a SHS for purchases; around 59% request them for ALL purchases, and they are also the most likely to supply them for ALL sales; 61% of NSW producers and 75% of SA producers supply them for ALL sales. Meanwhile, producers in QLD and WA are the most likely NEVER to request a SHS for purchases; more than three quarters NEVER requested a SHS, and there is a more even split across States in terms of those who never supply a SHS for sales; with around 45% in VIC and WA NEVER supplying them, 52% in TAS and 59% in QLD.

Although uptake of the SHS is highest in SA and NSW it is interesting to note that between 23-38% of producers NEVER requested/supplied a SHS in the last two years when its use is mandated (and all respondents had previously reported either purchasing sheep and bringing them onto property or selling sheep other than to slaughter at least once).

Tables 3.31 and 3.32 show equivalent data for OJD prevalence area.

	Low	Medium	High
0%	41.5	59.5	52.2
1-99%	3.4	6.5	6.1
100%	55.1	33.9	41.7
<b>Total (n)</b>	236	168	115

Table 3.31. Proportion of purchases for which producers requested a fully completed SHS, by OJD prevalence area. (column percents)

	<b>Low</b>	<b>Medium</b>	<b>High</b>
0%	23.7	44.3	48.4
1-99%	8.9	8.7	9.9
100%	67.4	47.0	41.8
<b>Total (n)</b>	224	149	91

*Table 3.32. Proportion of sales for which producers supplied a fully completed SHS, by OJD prevalence area.*

Data in Tables 3.31 and 3.32 show that those in low OJD prevalence areas are most likely ALWAYS to request a SHS when purchasing sheep and most likely ALWAYS to supply a SHS when selling sheep; 55% and 67% of producers in low prevalence areas ALWAYS request and supply an SHS, respectively. By comparison, just over half of producers in medium and high OJD prevalence areas are NEVER requesting a SHS and just under a half are NEVER supplying them.

The next block of questions in this section included a list of 20 statements around use of the SHS and attitudes towards it. Producers were asked to give their level of agreement with each statement. As mentioned earlier in the report, in the cross-tabulation of data with State and OJD prevalence area it was not possible to present full sets of response data for each of these statements, so this is provided in Appendix 4 and 5 by State and OJD prevalence area, respectively. To summarise questions with this format data 'indicators' have been provided for each question. In these 'indicator' tables the indicator is a simple summation of the producers in each State and in each OJD prevalence area who "strongly agree" + "agree" with the statement.

Table 3.33 summarises the data indicators for the 20 statements by State.

	NSW	VIC	QLD	SA	WA	TAS
The SHS is an effective tool for general disease management	72.1	63.1	66.7	78.7	61.4	72.5
I'm confident that I can complete the SHS accurately	87.5	79.6	75.0	95.9	67.0	72.5
I don't trust the information provided by others on the SHS	30.2	22.9	13.9	16.5	23.8	35.0
I sometimes feel uncomfortable asking for a SHS because it feels like I'm accusing the vendor of selling unhealthy sheep	14.9	20.3	13.9	17.1	12.5	22.5
I would sell with a SHS if my agent told me to	80.9	84.7	77.8	87.7	75.0	82.5
I would ask for a SHS when purchasing sheep if my agent told me to	80.0	82.2	77.8	83.6	64.7	77.5
My agent doesn't request a SHS when I'm purchasing sheep	27.0	33.2	36.1	15.0	37.5	50.0
I expect my agent to obtain a SHS on my behalf	71.6	72.0	61.1	78.1	53.4	65.0
I get better price for my sheep if I supply a SHS	39.0	37.0	30.6	47.2	36.4	40.0
I can decide on the health status of sheep by inspecting them myself at a sale	31.2	47.8	19.5	35.6	46.6	27.5
I don't complete a SHS because I don't have to	26.0	47.8	52.8	11.0	47.7	37.5
The SHS is just more paperwork	53.5	43.3	44.4	50.7	52.3	35.0
The NVD gives me all the information I need	55.8	56.6	72.2	63.0	60.2	37.5
I wouldn't buy sheep from someone who refused to complete a SHS	79.6	68.7	66.7	78.7	63.6	65.0
The SHS does not provide me with any benefits	24.6	27.4	33.3	23.3	27.3	25.0
The SHS hinders free trade	19.5	28.7	11.1	32.2	17.0	25.0
I use the points system (ABC scores) to guide my purchases	54.9	35.0	44.4	58.2	28.4	45.0
My own ABC score is so low that I can buy any sheep	26.1	22.3	25.0	28.0	25.0	22.5
I'm only interested in the SHS to see if sheep have been vaccinated against OJD	32.1	43.9	47.2	36.3	26.1	32.5
Recent changes to OJD prevalence areas and ABC scores in Victoria will have a major impact on my ability to trade sheep	15.8	41.4	8.3	21.2	29.6	20.0

Table 3.33. Data 'indicators' for use of the SHS statements (Q32), by State. (Responses = % "strongly agree" + "agree")

A number of attitudes regarding the SHS and its completion tended generally to follow the patterns of overall uptake, noted earlier. For example, producers in SA and NSW were more likely to regard the SHS as effective (79% and 72% respectively), feel more confident about being able to complete it accurately (96% and 88% respectively), more likely to use ABC points to guide their purchases (58% and 55%, respectively), feel that the SHS gave them more benefits (lower agreement with negative statement) (23% and 25%, respectively), and be less likely to buy from someone who refused to complete it (79% and 80%, respectively).

Looking more at the SA data, producers in SA indicated a stronger relationship with their agents; being more likely than producers in other States to sell and buy with an SHS if their agent encouraged them (84% and 88%, respectively), and expect their agent to obtain an SHS (78%). They were most likely to report that supplying an SHS got them a better price (47%).

NSW and TAS producers were most likely to distrust information provided by others on the SHS (30% and 35%, respectively).

VIC producers were more likely to feel uncomfortable sometimes asking for the SHS (20%), along with those from TAS (23%) and those in high OJD prevalence areas (20%). VIC and WA producers were more likely to report that they were able to decide on the health status of sheep by inspecting them themselves (48% and 47% respectively), less likely to use ABC points to guide their purchases (35% and 38% respectively), and along with QLD producers, more likely to say that they don't complete the SHS because they don't have to (VIC 48%; WA 48%, and QLD 53%)

Producers in QLD were more likely to report that the SHS gave them no benefits (33%), and least likely to agree that supplying one got them a better price (31%). In addition, those in QLD were most likely to use the SHS to see if sheep had been vaccinated against OJD (47%), least likely to distrust the information on a SHS (14%), and most likely to say that the SHS gave them all the information they needed (72%).

With regard to statements about agents and the SHS, those in NSW and SA were more likely to listen to the advice of their agents; these producers being most likely to request an SHS if told to (80% and 84%, respectively) and to supply an SHS if told to (81% and 88%, respectively). They were more likely to expect their agents to obtain an SHS for them (72% and 78%, respectively). Those in VIC and TAS were also more likely to sell with an SHS if their agent advised them to (85% and 83%, respectively), and those from VIC were also more likely to say they would request one on purchasing if advised by their agent (82%).

Those in WA were least likely to sell with a SHS if advised (75%) and to request an SHS on purchasing if advised (65%), and they were also least likely to report that they expect their agent to obtain an SHS on their behalf (53%). Producers from TAS were most likely to report that their agent doesn't request a SHS when purchasing for them (50%).

Table 3.34 summarises data indicators by OJD prevalence area.

	Low	Medium	High
The SHS is an effective tool for general disease management	75.2	61.7	69.1
I'm confident that I can complete the SHS accurately	90.0	73.3	82.9
I don't trust the information provided by others on the SHS	22.9	25.7	24.4
I sometimes feel uncomfortable asking for a SHS because it feels like I'm accusing the vendor of selling unhealthy sheep	15.7	16.0	20.4
I would sell with a SHS if my agent told me to	85.6	79.1	81.0
I would ask for a SHS when purchasing sheep if my agent told me to	82.4	74.3	78.9
My agent doesn't request a SHS when I'm purchasing sheep	20.4	36.9	36.1
I expect my agent to obtain a SHS on my behalf	75.5	64.1	67.1
I get better price for my sheep if I supply a SHS	43.3	37.9	34.2
I can decide on the health status of sheep by inspecting them myself at a sale	31.7	41.3	42.8
I don't complete a SHS because I don't have to	31.7	41.3	42.8
The SHS is just more paperwork	52.4	48.6	41.5
The NVD gives me all the information I need	62.1	57.2	50.7
I wouldn't buy sheep from someone who refused to complete a SHS	78.4	67.0	72.4
The SHS does not provide me with any benefits	25.4	25.3	27.0
The SHS hinders free trade	23.8	25.3	21.7
I use the points system (ABC scores) to guide my purchases	57.7	34.9	38.8
My own ABC score is so low that I can buy any sheep	25.7	24.3	25.6
I'm only interested in the SHS to see if sheep have been vaccinated against OJD	35.8	30.6	43.5
Recent changes to OJD prevalence areas and ABC scores in Victoria will have a major impact on my ability to trade sheep	16.6	32.6	28.9

Table 3.34. Data 'indicators' for use of the SHS statements (Q32), by OJD prevalence area. (Responses = % "strongly agree" + "agree")

Comparing attitudes to the SHS of producers from different OJD prevalence area, it is apparent that those in low OJD prevalence areas, who reported higher uptake of the SHS, were generally more positive about it. They were more likely to think it was effective (75%), feel more confident about completing it accurately (90%), report using ABC scores to guide purchases (58%), report that they get a better price if they sell with it (43%), and being unwilling to buy from someone who wouldn't complete one (78%).

By comparison, those producers in high OJD prevalence areas were more likely to agree that they don't use the SHS because they don't have to (43%), that it does not provide them

with any benefits (27%), that they could decide on the health status of sheep by inspecting them themselves at sale (43%), that they sometimes feel uncomfortable asking for a SHS (20%), and that they are only interested in the SHS to see if sheep have been vaccinated against OJD (44%).

The influence of agents was also more apparent on those producers in low OJD prevalence areas, with these producers indicating that they would be more willing to sell with a SHS if told to (86%), and request a SHS for purchases if told to (82%), and be more likely to expect their agents to obtain a SHS for them (76%).

At the end of this section of the interview, producers were asked if they knew their ABC score, and with what level of certainty. Tables 3.35 and 3.36 summarise these data by State and OJD prevalence area, respectively.

	<b>NSW</b>	<b>VIC</b>	<b>QLD</b>	<b>SA</b>	<b>WA</b>	<b>TAS</b>
With certainty	32.6	19.1	16.7	53.4	12.5	32.5
Probably	21.9	14.6	11.1	20.5	12.5	15.0
Unsure/Probably not	23.7	32.5	16.7	15.8	35.2	22.5
Definitely not/Don't know what this is	21.9	33.8	55.6	10.3	39.8	30.0
<b>Total (n)</b>	215	157	36	146	88	40

*Table 3.35. Confidence in knowing current ABC score, by State. (column percents)*

	<b>Low</b>	<b>Medium</b>	<b>High</b>
With certainty	42.9	19.9	19.7
Probably	21.0	14.6	15.1
Unsure/Probably not	17.9	32.0	30.9
Definitely not/Don't know what this is	18.2	33.5	34.2
<b>Total (n)</b>	319	206	152

*Table 3.36. Confidence in knowing current ABC score, by OJD prevalence area. (column percents)*

Data in Tables 3.35 and 3.36 somewhat mirror data presented earlier on use of the SHS (Tables 3.29-3.32); in that confidence about knowing current ABC score appears to correlate, unsurprisingly, with patterns of use of the SHS. Those in States and OJD prevalence areas who reported using the SHS more widely; producers in SA, NSW and low prevalence areas, are more likely to report that they are confident that they know their current ABC score, whereas those in QLD, WA and medium and high OJD prevalence areas are less confident, and more likely to report that they definitely don't know their ABC score, or know what an ABC score is.

### ***Use of the Sheep Health Statement (SHS): review and discussion***

This section was a large and core subject area within the survey, and therefore has been afforded greater consideration in the report and in further statistical modelling, reported later.

The section started with a question about general awareness of the SHS and familiarity with its content. More than one in five of the producers in this study (22%) had never heard of it, and a further 17% were aware of it, but not familiar with any of its content. It is therefore reasonable to report that almost 40% of producers were ignorant of the SHS. This finding, alone, would appear to represent a significant barrier to uptake of the SHS at a national level. Further investigation of familiarity with the SHS indicated that producers in QLD and WA and those residing in medium and high OJD prevalence areas were less likely to be familiar with, or aware of, the SHS.

Analysis of reported use of the SHS for purchasing and selling sheep indicated that its use was typically 'all or nothing'; either used all the time or none of the time, this tends to suggest that once producers begin to use the SHS it becomes part of their normal practice. Around 43% of producers reported that they always requested a SHS when purchasing and around 53% indicated that they always supplied a SHS when selling. Again there were clear differences in the uptake of the SHS between States; with SA having the highest uptake, followed by NSW. Uptake in VIC and TAS was generally lower, and uptake in QLD and WA was lowest overall.

Producers were asked to indicate situations in which they tend not to use the SHS. The most frequently mentioned situations were buying/selling for slaughter, buying/selling to friends or trusted producers, buying/selling in locations where the SHS was not mandatory and buying and selling lambs and rams. In terms of use, and usefulness of the SHS, most producers claimed to complete the SHS fully; those who skipped parts tended to skip the footrot or lice section, however, reports of skipped sections were low. Of the specific parts of the SHS found most useful, producers reported the consignment information, and the footrot and lice sections. It should be noted, however, that a large number of producers (n=192) reported that they found none of it useful, or they didn't know (n=138). This tends to suggest a degree of ambivalence, especially in those who, presumably, tend not to use the SHS.

In this section there was a large set of statements about attitudes towards the SHS; its usefulness, benefits, potential reasons for not using it, role of agents in its uptake, etc., and producers were asked to give their level of agreement with each. Overall, attitudes were fairly positive with around 70% reporting that it was an effective tool for disease management, and 73% reporting that they wouldn't buy from a producer who refused to complete one. Similar proportions would also be influenced by their agent; supplying or requesting an SHS if advised by them to. Despite the generally positive responses, it was also noted that around a quarter felt that the SHS provided them with no benefits and a third indicated that they don't complete the SHS because they don't have to.

Many of the more positive attitudes tended to follow patterns of its use within States, such that producers in SA, NSW and those in low prevalence areas, who report greater uptake, tended to view the SHS more positively, feel more confident about completing it, and feel that there were more benefits to its use. Those in WA and QLD generally held less positive views; although the views of these producers were still quite favourable overall.



Producers were asked if they knew their current ABC score, and how confidently they felt they knew it. Around 30% of producers reported they knew their ABC score with certainty and around 11% reported that they did not know what an ABC score was. In general responses tended to mirror SHS uptake patterns, with those in SA, NSW, and low OJD prevalence areas reporting that they were more confident that they knew their current ABC score.

Finally producers were asked what would encourage better use of the SHS. Although many said they didn't know, those who made suggestions recommended stricter enforcement, further education and awareness programs, simplification of its use/application, and more attention from authorities regarding implementation, testing and inspecting.

## General health of sheep

### Whole sample frequency data

This section was fairly short and asked all producers about their prior experience of buying diseased sheep, the conditions they had, and some general questions about their attitudes to sheep diseases.

Producers were asked if they had bought diseased sheep in the past; 17% reported they had, and 83% that they hadn't. Those that indicated they had purchased diseased sheep (n=150) were then asked what diseases or conditions these sheep had. Table 3.37 summarises these responses.

Diseases/conditions	N	Percent
Lice	70	8.1
Footrot	63	7.2
OJD	19	2.2
Brucellosis	5	0.6
Internal Parasites	8	0.9

Table 3.37. Details of the diseases/conditions that purchased sheep had.

In addition to the main diseases/conditions reported in Table 3.37, a further eight producers reported that they didn't know what the disease/condition was, or they couldn't get it diagnosed. Other reported diseases/conditions included; dermatitis (3), cheesy gland (2), pulpy kidney (2), cancer (1), foot scald (1), itch mite (1), and flystrike (1).

Producers were then presented with four statements about sheep health and were asked to give their level of agreement or disagreement with each statement. These data are summarised in Figure 3.10, and data tables are provided in Appendix 3b (Q37).

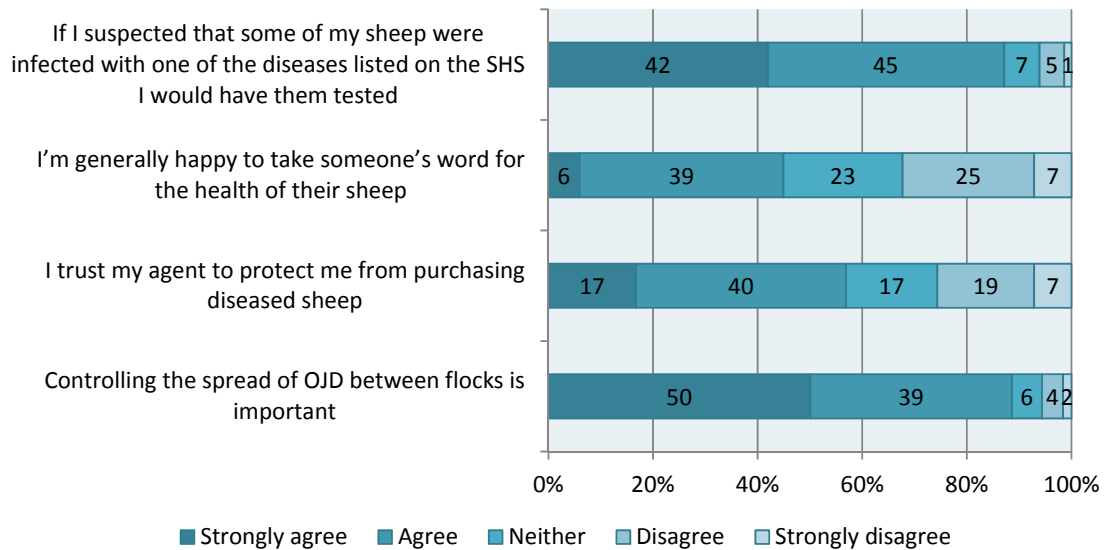


Figure 3.10. Level of agreement with statements about sheep health.

The data shown in Figure 3.10 generally indicate a very positive response to sheep health with 87% of producers reporting that they would get sheep tested if they suspected they were infected with any of the diseases listed on the SHS, and 89% agreeing that controlling the spread of OJD is important. More than half (57%) agreed that they trusted their agent to protect them from purchasing diseased sheep and there was a slightly more mixed opinion to how happy producers felt they were to accept someone's word for the health of the sheep, with 45% agreeing they would be happy to accept someone's word, and 32% disagreeing.

#### **Analysis by State and OJD prevalence area**

Data from this section of the survey were analysed by State and OJD prevalence area to investigate differences in attitudes and practices. Tables 3.38 and 3.39 summarise the responses to the first question in this section which asked producers if they had bought diseased sheep in the past.

	<b>NSW</b>	<b>VIC</b>	<b>QLD</b>	<b>SA</b>	<b>WA</b>	<b>TAS</b>
Yes	20.3	19.1	3.7	13.1	15.2	26.9
No	79.7	80.9	96.3	86.9	84.8	73.1
<b>Total (n)</b>	251	215	54	153	145	52

Table 3.38. Producers who had bought diseased sheep in the past, by State.

	<b>Low</b>	<b>Medium</b>	<b>High</b>
Yes	12.9	17.9	23.6
No	87.1	82.1	76.4
<b>Total (n)</b>	364	291	208

Table 3.39. Producers who had bought diseased sheep in the past, by OJD prevalence area.

Data in Tables 3.38 and 3.39 indicate variations in the numbers of producers who had bought diseased sheep; with purchase of diseased sheep being much lower in QLD than the other States and levels in SA and WA being relatively low. Around a quarter of producers living in TAS and those living in high OJD prevalence areas reported having purchased diseased sheep.

The next question asked producers what diseases or conditions the diseased sheep had, these responses are summarised in Tables 3.40 and 3.41 for State and OJD prevalence area, respectively. Producers could list more than one condition.

	<b>NSW</b>	<b>VIC</b>	<b>QLD</b>	<b>SA</b>	<b>WA</b>	<b>TAS</b>
Lice	7.2	8.4	3.7	8.5	10.3	7.7
Footrot	10.8	8.4	0.0	2.6	2.8	19.2
OJD	1.6	4.7	0.0	0.7	0.0	7.7
Brucellosis	0.8	0.0	0.0	1.3	0.7	0.0
Internal Parasites	0.4	1.4	1.9	1.3	0.7	0.0

Table 3.40. The disease/condition of the diseased sheep, by State.

	Low	Medium	High
Lice	6.3	8.9	10.1
Footrot	5.0	6.2	12.5
OJD	0.3	2.4	5.3
Brucellosis	0.8	0.7	0.0
Internal Parasites	1.1	0.7	1.0

Table 3.41. The disease/condition of the diseased sheep, by OJD prevalence area.

Lice and footrot were the most frequently reported conditions overall, with more footrot reported in NSW and TAS and more OJD in VIC and TAS. It should be born in mind, however, that these would probably be the easiest conditions for producers to see and diagnose. The data breakdown by OJD prevalence area indicates increased frequencies of most of the five main conditions listed on the SHS with increasing OJD prevalence. As might be expected, OJD diseased sheep were reported more in higher OJD prevalence areas, but there are also higher reported levels of footrot and lice in purchased diseased sheep.

In the final part of this section producers were asked to indicate their level of agreement with four statements about sheep health and disease. As before, data ‘indicators’ are provided here, with a full set of data tables with responses by State and OJD prevalence area included in Appendix 4 and 5, respectively.

Tables 3.42 and 3.43, summarise the data indicators for the four statements; these indicators are the summed “strongly agree” and “agree” responses for each.

	NSW	VIC	QLD	SA	WA	TAS
If I suspected that some of my sheep were infected with one of the diseases listed on the SHS I would have them tested	84.0	82.3	94.5	91.5	91.8	88.5
I'm generally happy to take someone's word for the health of their sheep	39.5	46.0	40.8	48.3	49.0	50.0
I trust my agent to protect me from purchasing diseased sheep	50.6	60.9	50.0	66.0	55.9	53.8
Controlling the spread of OJD between flocks is important	84.4	85.6	90.8	92.2	93.1	96.1

Table 3.42. Data ‘indicators’ for use of the SHS statements (Q32), by State. (Responses = % “strongly agree” + “agree”)

	Low	Medium	High
If I suspected that some of my sheep were infected with one of the diseases listed on the SHS I would have them tested	90.7	89.4	77.9
I'm generally happy to take someone's word for the health of their sheep	44.0	51.2	38.0
I trust my agent to protect me from purchasing diseased sheep	58.8	58.7	51.9
Controlling the spread of OJD between flocks is important	90.7	91.7	80.3

*Table 3.43. Data 'indicators' for use of the SHS statements (Q32), by OJD prevalence area. (Responses = % "strongly agree" + "agree")*

Most producers agreed with the statement that if they suspected disease in their sheep they would get them tested, with a larger proportion of producers in QLD agreeing with this statement (95%) and more producers in high OJD prevalence areas (91%) agreeing. Producers in NSW and those in high OJD prevalence areas were less likely to be happy to take someone's word for the health of their sheep (40% and 38%, respectively).

Producers in VIC and SA were more likely to report that they trust their agent to protect them from purchasing diseased sheep (61% and 66%, respectively). Most producers feel that controlling OJD between flocks is important and agree overwhelmingly with this statement, however, those in high OJD prevalence areas and those in NSW and VIC tended to agree with this statement less than other groups (High 80%; NSW 84%; VIC 86%).

### **General health of sheep: review and discussion**

In this short section producers were asked about their prior experience of purchasing diseased sheep and their attitudes to sheep health and disease.

Overall around 17% of producers indicated that they had bought diseased sheep in the past with lice and footrot being the most frequently reported conditions. Differences were noted between States with those in NSW, TAS and high OJD prevalence areas reporting higher likelihood of purchasing diseased sheep and with lice and footrot being the most often cited conditions that affected these sheep. However, it was also noted that these conditions might also be the easiest to detect and diagnose and therefore there could be under-reporting / under-diagnosis of the other conditions.

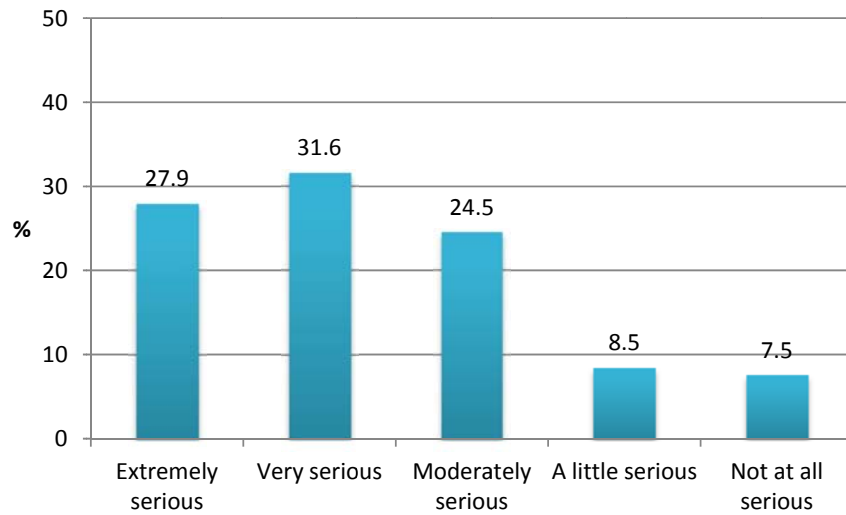
When asked about their attitudes to sheep health, most producers reported they would get sheep tested if they suspected disease, and that it was important to control the spread of OJD between flocks. There were slightly lower levels of agreement with these statements from producers in NSW, VIC, and those in high prevalence areas; although producers from all States agreed overwhelmingly (>80%) with these statements.

As noted earlier in the section on the use of the SHS, producers in NSW were slightly less trusting, with around 40% indicating that they would not generally be happy to take someone's word for the health of their sheep. It is possible that this finding is related to the higher incidence of purchasing disease sheep, found with this group. Prior experience of purchasing diseased sheep may make producers more cautious and less trusting of others.

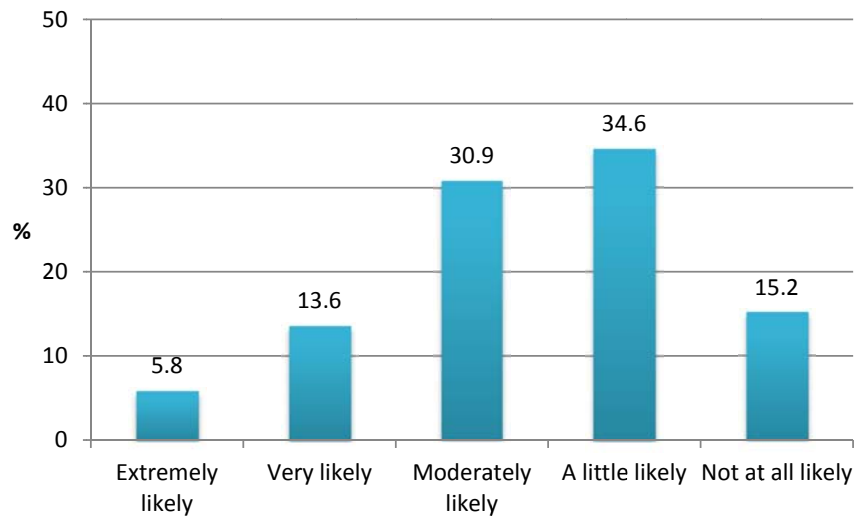
## Disease threat appraisal

### *Whole sample frequency data*

This section comprised questions designed to assess the sheep disease threat appraisal of producers and their perceived ability to control these threats. Producers were asked, in general terms, about their perception of the seriousness of disease threats and likelihood of sheep diseases affecting their sheep, and also about their confidence in their ability to prevent diseases and the effectiveness of the disease prevention and management options they have available to them. Responses to these questions are summarised in Figures 3.11-3.14.



*Figure 3.11. Perceived seriousness of sheep disease threats to producers' sheep production enterprises.*



*Figure 3.12. Perceived likelihood of their sheep becoming affected by sheep diseases.*

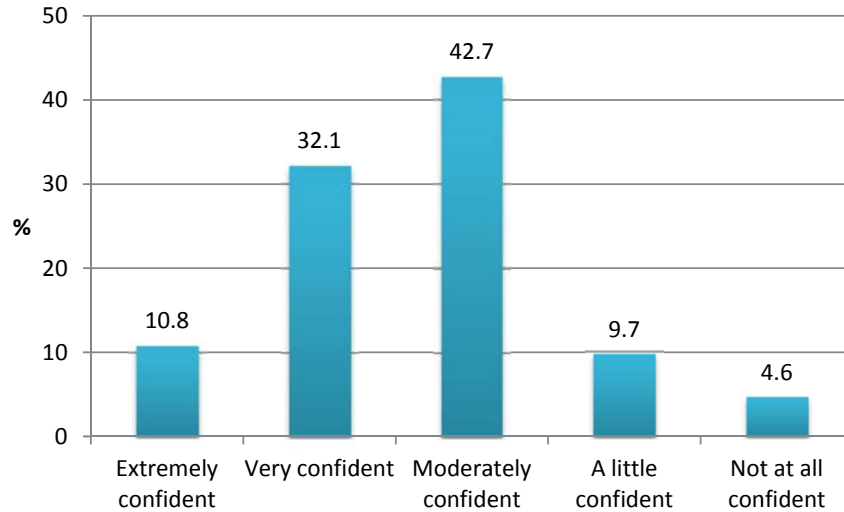


Figure 3.13. Perceived confidence in ability to prevent sheep becoming affected by sheep diseases.

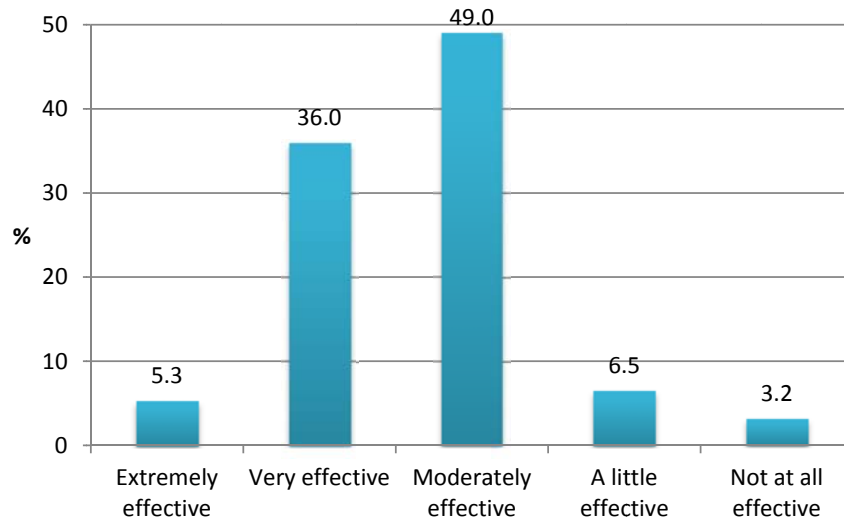


Figure 3.14. Perceived effectiveness of sheep disease prevention and management options available to producers.

Data from these questions will be used in further statistical analysis to investigate producer motivation for sheep health protection behaviours, such as uptake of the SHS and good on-farm disease management. In very general terms, data in Figure 3.11-2.14 suggest that producers, overall, feel that disease threats are generally fairly serious to their enterprises but that they are relatively unlikely to occur or affect their sheep, and therefore, as a population they may not have a particularly strong perception of vulnerability to these disease threats. To counter these threats, producers in general, appear to be confident that they can prevent their sheep getting diseases, and feel that the sheep disease prevention and management options that are available to them would be moderately effective. These

data would suggest that sheep producers generally feel that they have a sense of self-efficacy and control over disease threats.

### ***Analysis by State and OJD prevalence area***

Sheep disease threat and coping appraisal questions were analysed by State and OJD prevalence area. Tables 3.44 and 3.45 summarise 'indicator' data for the four threat appraisal questions. In these tables the indicator is the summated percentage of producers responding 'extremely' and 'very' for each question, by State and by OJD prevalence area. Tables of the full set of responses are included in Appendix 4 and 5, respectively.

	<b>NSW</b>	<b>VIC</b>	<b>QLD</b>	<b>SA</b>	<b>WA</b>	<b>TAS</b>
Perceived seriousness	63.5	60.5	40.7	57.9	55.5	71.1
Likelihood of becoming affected	20.8	20.8	14.9	16.4	16.9	27.0
Confidence in prevention	48.4	35.5	40.8	54.6	38.5	26.9
Effectiveness of prevention and management options	40.1	36.2	41.2	53.3	41.2	33.3

*Table 3.44. General disease threat and coping appraisal, by State. (Responses = % "extremely" and "very").*

	<b>Low</b>	<b>Medium</b>	<b>High</b>
Perceived seriousness	58.2	58.8	62.5
Likelihood of becoming affected	17.1	18.4	24.8
Confidence in prevention	53.1	35.0	35.6
Effectiveness of prevention and management options	44.5	37.6	40.4

*Table 3.45. General disease threat and coping appraisal, by OJD prevalence area. Responses = % "extremely" and "very").*

As mentioned earlier, these four questions cover some key components of a number of health behaviour models, and are often studied in health protection research to investigate health protective behaviours. Reviewing data in Table 3.44 it appears that producers in NSW, VIC and TAS have higher levels of threat perception; with these producers seeing the general threat of sheep disease as both more serious and more likely to affect their animals. With regard to the coping appraisal questions, producers in TAS and VIC also feel relatively less able to manage sheep diseases; feeling both less able to prevent them occurring (lower self-efficacy/control) and less confident in the effectiveness of the prevention and management options open to them, compared to producers from other States. These findings would suggest that producers in TAS and VIC are likely to be relatively more concerned about such threats. In the general, mostly health-based, literature those with the greatest sense of self-efficacy are likely to be more prepared, less anxious, and more motivated to take action. If this is so, it would suggest that producers in SA have an upper hand; with higher confidence in their ability to prevent their sheep getting diseases. These producers are also more confident in the effectiveness of their disease management options.

Taking a similar approach with the OJD prevalence area analysis, those in high prevalence areas appear to have a greater threat appraisal for general sheep diseases, and they also appear to have a lower coping appraisal than those in low OJD prevalence areas. This



would, again, suggest a relatively higher level of internal tension for producers in these areas.

***Disease threat appraisal: review and discussion***

This short section comprised four questions on threat and coping appraisal in relation to general sheep disease threats, and covered constructs often addressed in public health protective behaviour research and similar research in disaster response and preparedness.

In general, producers feel that disease threats are serious, but that they are relatively unlikely to be affected by them. This is likely to lower their general sensitivity to such threats, especially as a sense of vulnerability is likely to be the stronger driver of threat perception. In relation to coping with disease threats, producers generally seem to feel fairly confident that they can take effective action to prevent diseases (self-efficacy/control), and they are moderately confident in the effectiveness of the disease management and prevention options they have available to them. Research would suggest that, of these factors, a sense of self-efficacy or control is the one that is most likely to determine uptake of recommended protective behaviours; in this biosecurity context, uptake of the SHS and operation of good disease management practices.

Looking at the threat and coping appraisal data by State and OJD prevalence area it is clear that producers perceive the general threat of sheep disease differently. Data would suggest that producers in VIC and TAS, and those in high OJD prevalence areas, are likely to have higher levels of internal conflict in relation to disease threat; having a greater sense of threat severity and higher perceived vulnerability, but at the same time feeling less able to take effective action and having less confidence in the effectiveness of the actions that could be taken. Of all producers, these groups may be more amenable and receptive to support and intervention. By comparison, producers in SA, and NSW to a slightly lesser extent, appear to be better placed; with a moderately high perception of threat severity, but with a more robust perception of their ability to cope and manage these threats.

## Current management practices

### Whole sample frequency data

In this section producers were asked about their current on-farm management practices.

This section comprised two multi-part questions; the first comprised a list of 10 biosecurity and disease management practices and asked producers to indicate the frequency with which they perform these, and the second question comprised six statements about animal health management and disease spread and asked producers to indicate their level of agreement or disagreement with each statement. The frequency of current management practice behaviours is summarised in Figure 3.15 and data tables are provided in Appendix 3c (Q42).

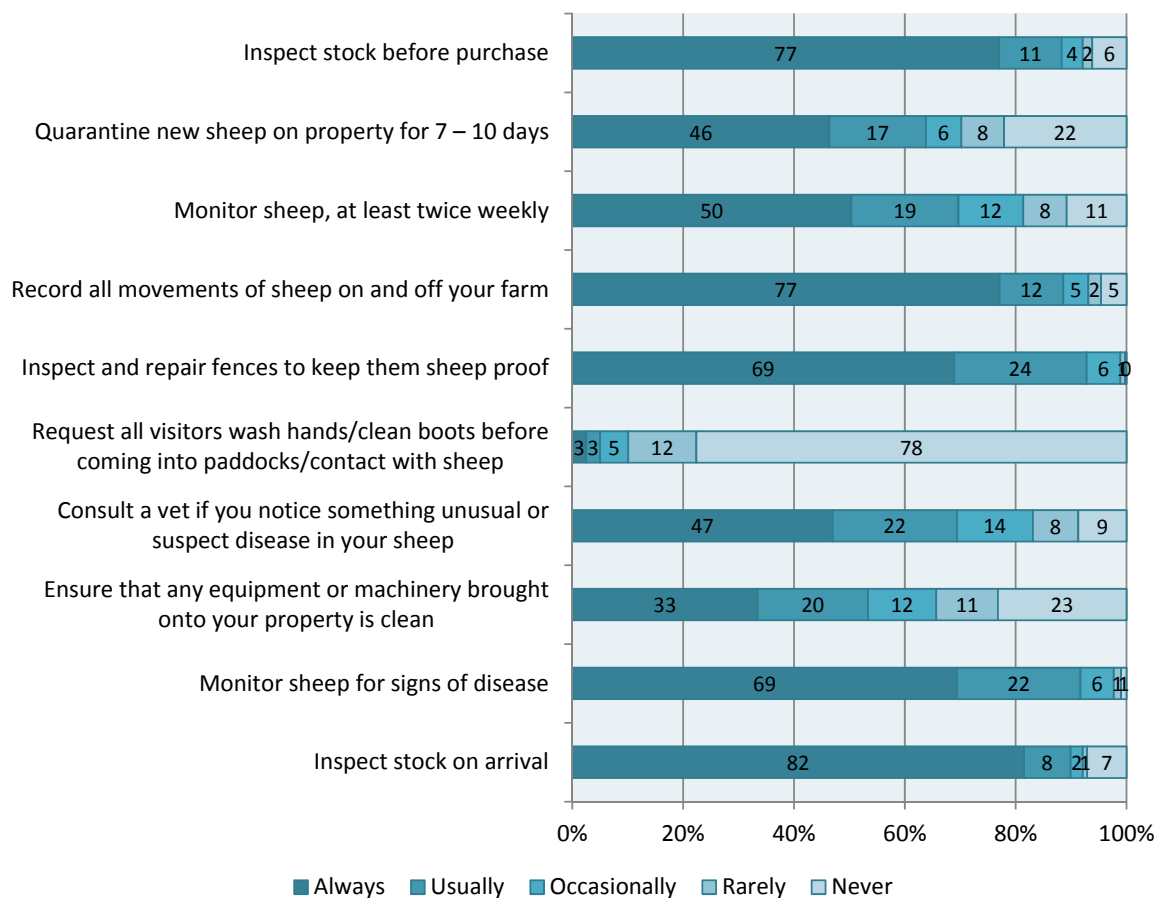


Figure 3.15. Frequency of performing a range of on-farm disease management and biosecurity practices.

As can be seen from Figure 3.15, very large proportions of producers report that they always inspect stock on purchase and arrival, record all movements of sheep, inspect and repair fences and monitor for signs of disease. By comparison, relatively few request that visitors clean their hands and boots before having contact with their sheep, and fewer producers ensure equipment/machinery is clean before bringing it onto their property, or will

necessarily consult a vet if they notice something unusual or suspect disease. Similarly, there is a range of responses relating to those who monitor sheep at least twice weekly or quarantine new sheep on property for 7-10 days.

Figure 3.16 summarises the attitudes to health management and disease spread. Data tables are provided in Appendix 3d (Q43).

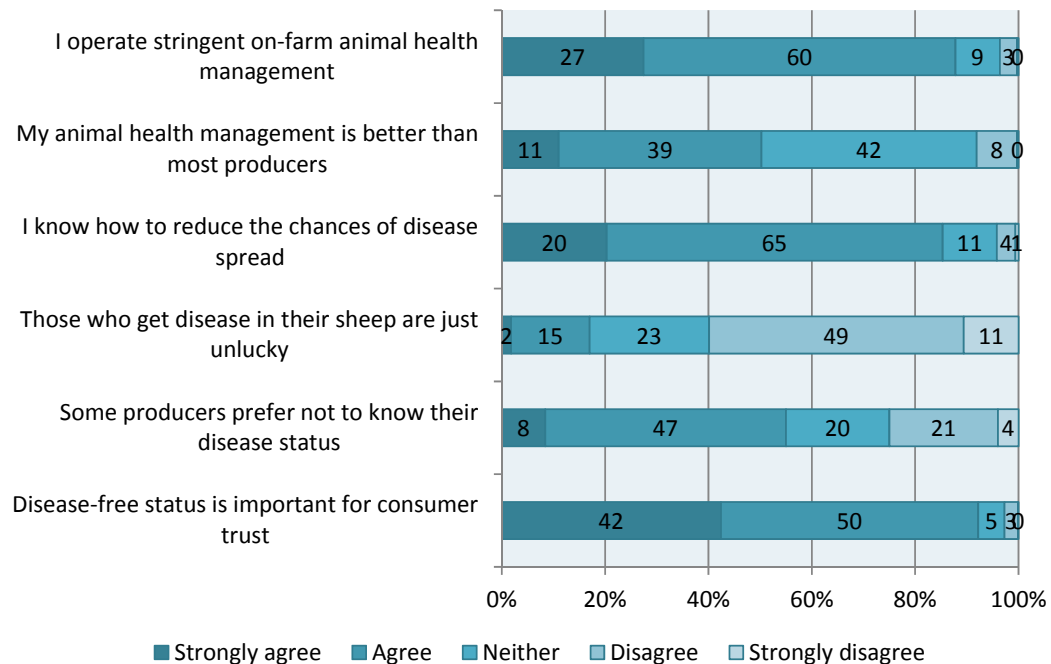


Figure 3.16. Attitudes to animal health management and disease spread.

Data presented in Figure 3.16 indicate that there is an overwhelming agreement amongst producers that disease-free status is important for consumer trust, that they operate stringent on-farm animal health management, and that they know how to reduce the chances of disease spread. Half of producers agree that their health management practices are better than most producers and 60% disagree that those who get disease in their sheep are just unlucky; that does suggest that 40% somewhat agree with this statement. Possibly one of the more surprising findings is that over half of producers (55%) agree that some producers prefer not to know their disease status.

### Analysis by State and OJD prevalence area

Data from these two multi-part questions were cross-tabulated by State and OJD prevalence area. As before with these types of questions, data 'indicators' have been tabulated and shown here and a full set of data tables has been included in Appendix 4 and 5 for reference. Table 3.46 summarises the data indicators for the frequency with which producers operate the listed management practices, data indicators, presented here, are the percentage of producers who reported responses of "always" and "usually"

	NSW	VIC	QLD	SA	WA	TAS
Inspect stock before purchase	90.5	86.6	83.4	85.6	89.0	96.2
Quarantine new sheep on property for 7 – 10 days	66.1	69.7	55.6	54.9	58.0	78.8
Monitor sheep, at least twice weekly	60.5	78.2	22.3	77.8	81.4	71.2
Record all movements of sheep on and off your farm	91.3	83.3	94.4	86.2	91.1	92.3
Inspect and repair fences to keep them sheep proof	92.4	94.0	90.7	90.2	97.3	86.5
Request that all visitors wash their hands and clean their boots before coming into your paddocks or into contact with your sheep	4.8	7.0	0.0	0.0	6.2	15.4
Consult a vet if you notice something unusual or suspect disease in your sheep	70.1	72.5	61.1	67.3	67.6	73.0
Ensure that any equipment or machinery brought onto your property is clean	53.4	54.9	42.6	51.6	55.2	57.7
Monitor sheep for signs of disease	93.6	90.3	81.5	89.6	94.5	98.1
Inspect stock on arrival	89.7	90.2	90.8	90.2	86.9	96.2

Table 3.46. Current management practices – data indicators by State. (Responses = % “always” and “usually”).

A number of differences were observed between the responses of producers in different States. Producers in TAS reported more frequently than those in other States that they inspected stock before purchase and on arrival (96% for both), they were also more likely to quarantine new sheep for 7-10 days (79%), ask visitors to wash before having contact with their sheep (15%), and monitor sheep for signs of disease (98%).

By comparison, producers in QLD were the least likely to report that they inspected sheep before purchase (83%), quarantined sheep (31.5%), monitored sheep at least twice weekly (22%), requested visitors wash (0%), consulted a vet if they suspect disease (61%), monitored sheep for signs of disease (82%), and ensured that machinery brought onto property is clean (43%). They were, however, the mostly likely to report that they recorded all movements on and off farm (94%). This latter response compares with VIC producers who were least likely to record all movements (83%).

Compared to producers in other States, producers from SA and VIC were also relatively less likely to report that they inspected stock before purchase (86% and 87% respectively) and recorded all movements (86% and 83% respectively). SA producers were also less likely to ask visitors to wash (0%) or quarantine new sheep (55%).

Similar data indicators were tabulated for producers from different OJD prevalence areas. These data are summarised in Table 3.47.

	<b>Low</b>	<b>Medium</b>	<b>High</b>
Inspect stock before purchase	88.2	89.4	88.0
Quarantine new sheep on property for 7 – 10 days	58.5	65.7	71.6
Monitor sheep, at least twice weekly	62.1	76.6	73.5
Record all movements of sheep on and off your farm	89.8	91.1	83.6
Inspect and repair fences to keep them sheep proof	91.0	94.5	93.8
Request that all visitors wash their hands and clean their boots before coming into your paddocks or into contact with your sheep	2.5	6.9	6.7
Consult a vet if you notice something unusual or suspect disease in your sheep	69.8	69.8	68.8
Ensure that any equipment or machinery brought onto your property is clean	52.2	53.7	55.3
Monitor sheep for signs of disease	90.4	93.1	91.9
Inspect stock on arrival	90.2	91.0	89.4

*Table 3.47. Current management practices – data indicators by OJD prevalence area. (Responses = % “always” and “usually”).*

Data in Table 3.47 suggest that more producers in medium OJD prevalence areas tend to report higher frequencies of the listed management practices than those in other areas. They reported recording all movements on and off farm (91%), monitoring sheep for signs of disease (93%), inspecting stock before purchase and on arrival (89% and 91% respectively), and requesting visitors to wash (7%). By comparison, those in low prevalence areas were least likely to quarantine new sheep (62%), monitor sheep at least twice weekly (62%), inspect and repair fences (91%), and request visitors to wash (3%).

In the second set of multi-part questions, producers were presented with statements and asked to indicate their level of agreement. As before, data ‘indicators’ have been shown in the following tables, combining the percentage of producers who reported they “strongly agree” and “agree” with the statements. Table 3.48 summarises these data by State and Table 3.49 summarises these data by OJD prevalence area.

	NSW	VIC	QLD	SA	WA	TAS
I operate stringent on-farm animal health management	90.0	87.9	79.6	89.6	84.9	86.5
My animal health management is better than most producers	51.8	50.2	48.1	51.0	49.7	44.2
I know how to reduce the chances of disease spread	88.0	86.0	87.1	83.7	82.1	82.7
Those who get disease in their sheep are just unlucky	13.2	16.7	14.8	20.9	20.0	19.2
Some producers prefer not to know their disease status	53.4	66.5	42.6	51.6	46.9	59.6
Disease-free status is important for consumer trust	93.2	91.6	94.4	92.9	91.1	88.4

Table 3.48. Health management and disease spread – data indicators by State (Responses = % “strongly agree” + “agree”)

	Low	Medium	High
I operate stringent on-farm animal health management	87.9	87.0	88.4
My animal health management is better than most producers	51.1	49.2	50.5
I know how to reduce the chances of disease spread	86.0	85.3	84.1
Those who get disease in their sheep are just unlucky	17.6	19.2	12.9
Some producers prefer not to know their disease status	50.0	52.9	67.3
Disease-free status is important for consumer trust	94.0	90.7	90.9

Table 3.49. Health management and disease spread – data indicators by OJD prevalence area. (Responses = % “strongly agree” + “agree”)

Data in Table 3.48 indicate that producers in NSW agree more than those in other States, that they operate stringent on-farm standards (90%), that their animal health practices are better than most producers (52%), that they know how to reduce the chances of disease spread (88%). They were also the least likely to agree that those who get disease in their sheep are just unlucky (13%). Producers in VIC were most likely to agree that some producers prefer not to know their disease status (67%), and those in QLD were most likely to agree that disease-free status is important for consumer trust (94%), although most producers felt strongly about the latter.

Producers in QLD were least likely to agree that they operate stringent on-farm animal health management (80%) and those in TAS were least likely to agree that their animal health management was better than most producers (44%).

Regarding differences in attitudes between producers in different OJD prevalence areas, those in high prevalence areas were more likely to agree that some producers prefer not to know their disease status (67%) and least likely to agree that those who get disease are just

unlucky (13%). Those in low OJD prevalence areas were most likely to agree that disease-free status is important for consumer trust (94%) and least likely to agree that some producer prefer not to know their disease status (50%).

***Current management practices: review and discussion***

This section comprised two multi-part questions, the first asked producers about the frequency with which they operated a range of biosecurity and health management practices, and the second covered health management and disease spread attitudes.

In general, levels of self-reported biosecurity and disease management practices were high, with most producers inspecting sheep before purchase and on arrival and recording all movements on and off farm. The reported frequencies of the remaining management practices were more varied, although mostly fairly high. Producers were most unlikely to be asking visitors to wash hands and clean boots before coming into paddocks or having contact with sheep, also relatively few were likely to ensure that equipment brought onto property was clean, to consult a vet if they noticed something unusual or suspected disease, or to quarantine new sheep for 7-10 days.

Analysis of attitudes to health management and disease spread indicated that most producers believed that they operated stringent management practices and that their practices were better than others'. However, quite a lot felt that some producers preferred not to know their disease status.

Data were analysed by State and OJD prevalence area, and differences were reported. Generally, producers in TAS and high OJD prevalence areas reported relatively higher levels of biosecurity and those in QLD reported relatively lower levels; although still fairly high overall. Attitudes to health management and disease spread also varied by State and OJD prevalence area; those in NSW generally reported more positive attitudes to their own practice, whilst those in VIC and high OJD prevalence areas were more likely to indicate that some producers prefer not to know their disease status.

Data from this section will be subject to more in-depth analysis at a later date, and it is possible that some of the differences noted here between producers may be explained by factors such as farm size/head of sheep, flock operation, and producer characteristics.

## OJD/SHS status in area

### *Whole sample frequency data*

Producers, in this closing section, were asked a range of questions about the status of the SHS and of OJD prevalence in their area. In the first question producers were asked whether use of the SHS was mandatory in their State. Table 3.50 summarises these responses.

SHS mandatory	Frequency	Percent
Yes	348	40.0
With some exceptions	45	5.2
No	297	34.1
Don't know	180	20.7

*Table 3.50. Is use of the SHS mandatory in your State?*

Next, producers were asked what their current 2011 OJD prevalence area was, and then how confident they were that this response was correct. Table 3.51 shows the overall spread of prevalence area responses and also shows the proportion that believed their response was correct.

Prevalence area	Frequency	Percent	Percent confident answer is correct
High	70	8.1	81.4
Medium	116	13.3	70.7
Low	340	39.1	86.2
Other	39	4.5	87.2
Don't know	305	35.1	-

*Table 3.51. Current 2011 OJD prevalence area for sample and proportion confident that this response is correct.*

Overall very few producers appear to be from high OJD prevalence areas (8.1%), although over a third didn't know what their prevalence area was. In total, 79.8% of producers were confident that their response was correct to this question and data in Table 3.51 show that those who reported being in medium prevalence areas were slightly less confident than others.

Producers were asked if their OJD prevalence area changed on 01 January 2011, 27.2% said 'yes', and 72.8% said 'no'. They were then asked if they felt that their prevalence area reflected the true level of OJD in their district; 47.1% said 'yes', 21.3% said 'no', and 31.5% said 'don't know'. Those who responded 'no' (n=182) were then asked why the prevalence area didn't reflect the true level of OJD in their district. Figure 3.17 show summary data for this open comment question.



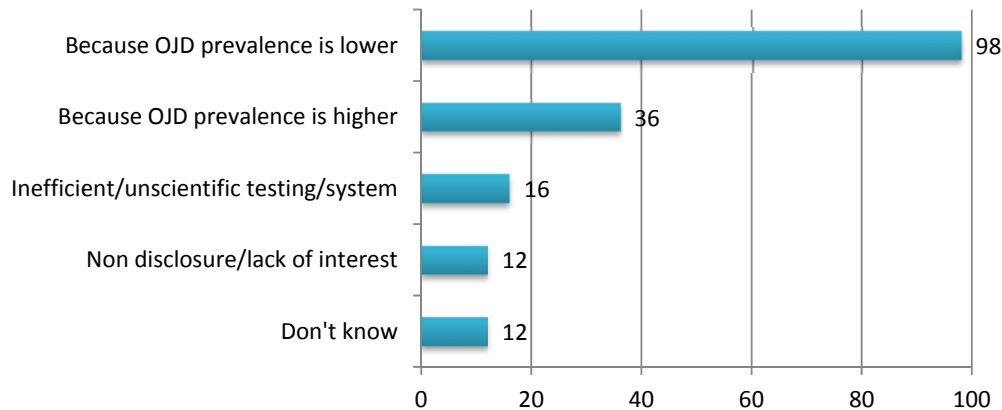


Figure 3.17. Summary of reasons why producers (n=182) believe their current prevalence area does not reflect the true level of OJD in their district.

As can be seen from data in Figure 3.17 those who didn't feel that the new prevalence area reflected the true prevalence of OJD in their area were more likely to feel that this was because the OJD prevalence was lower.

#### Analysis by State and OJD prevalence area

Data in this section were cross-tabulated by State and OJD prevalence area. Tables 3.52 and 3.53 summarise findings on the status of the SHS in producers' areas.

	NSW	VIC	QLD	SA	WA	TAS
Yes	51.0	23.7	16.7	83.0	13.8	25.0
With some exceptions	8.0	6.1	0.0	3.3	3.5	3.9
No	26.7	41.9	48.2	5.2	55.2	50.0
Don't know	14.3	28.4	35.2	8.5	27.6	21.2
<b>Total (n)</b>	251	215	54	153	145	52

Table 3.52. Perceived SHS status, by State.

	Low	Medium	High
Yes	61.8	21.7	26.9
With some exceptions	5.5	4.5	5.8
No	18.4	47.8	42.3
Don't know	14.3	26.1	25.0
<b>Total (n)</b>	364	291	208

Table 3.53. Perceived SHS status, by OJD prevalence area.

The majority of producers in SA (83%) report that the SHS is mandatory in their area, and just over 50% of producers in NSW report that it's mandatory. More than a third of producers in QLD (35%) don't know the status of the SHS and around a quarter of producers in VIC, WA and TAS also report that they don't know (28%, 28%, and 21%, respectively). Just under

two thirds (62%) of producers in low OJD prevalence areas report that the SHS is mandatory in their area.

Table 3.54 summarises the self-reported OJD prevalence area of producers by State and Table 3.55 shows producers' verified/confirmed OJD prevalence areas by State calculated by the research team from demographic data; State, Shire/LHPA, postcode, as described earlier in the report.

	<b>NSW</b>	<b>VIC</b>	<b>QLD</b>	<b>SA</b>	<b>WA</b>	<b>TAS</b>
High	13.2	11.6	0.0	5.2	2.8	0.0
Medium	10.4	17.2	3.7	4.6	<b>20.7</b>	<b>26.9</b>
Low	45.0	24.7	<b>33.3</b>	<b>58.8</b>	34.5	30.8
Other <sup>4</sup>	4.4	1.9	24.1	4.6	2.8	0.0
Don't know	27.1	44.7	38.9	26.8	39.3	42.3
<b>Total (n)</b>	251	215	54	153	145	52

Table 3.54. Self-reported OJD prevalence area by State. Data in bold indicate the proportion of producers who accurately self-reported their OJD prevalence area<sup>5</sup>.

	<b>NSW</b>	<b>VIC</b>	<b>QLD</b>	<b>SA</b>	<b>WA</b>	<b>TAS</b>
High	28.3	63.7	-	-	-	-
Medium	6.4	36.3	-	-	100.0	100.0
Low	62.5	-	100.00	100.0	-	-
Don't know	2.8	-	-	-	-	-
<b>Total (n)</b>	251	215	54	153	145	52

Table 3.55. Verified OJD prevalence area for producers in the sample by State.

As data in Tables 3.54 and 3.55 attest, accuracy of current OJD prevalence area is fairly poor. Producers in SA have the best prevalence area knowledge with 59% accurately self-reporting their prevalence area, however, even in this State more than a quarter of producers report that they do not know their OJD prevalence area. Only a third of producers in QLD, just over a quarter in TAS and around 1 in 5 in WA correctly gave their OJD prevalence area. Data for producers in NSW and VIC could not be presented in Table 3.54, due to these States and those in the sample residing in multiple prevalence areas. These data are summarised below in Table 3.56 for each prevalence area within these States.

<sup>4</sup> "Other" responses were responses that were not "low", "medium" or "high". However, all these responses were coded under a single heading of "none/free of it" by the interviewers. If these responses were classified, instead, as "low" then the % correct for QLD would be much higher (57.4%) and SA would be a little higher too (63.4%).

<sup>5</sup> There were no producers in the sample from Flinders Island, TAS or Kangaroo Island, SA, therefore these groups in the sample were single prevalence.

Verified prevalence area		NSW			VIC	
		Low	Medium	High	Medium	High
Self-reported OJD prevalence area	High	-	-	33.8	-	16.8
	Medium	-	37.5	-	16.7	-
	Low	63.1*	-	-	-	-
	<b>Total (n)</b>	157	16	71	78	137

Table 3.56. Proportion of producers in NSW and VIC correctly self-reporting their current OJD prevalence area. (\*This would be 70.0% if 'other' responses were coded as 'low', see footnote 3.)

As can be seen from the data in Table 3.56 producers in low OJD prevalence areas of NSW had the highest level of accurate self-reporting of all groups with 63% giving an accurate report. However, only around a third of producers in medium and high prevalence areas correctly self-reported (38% and 34%, respectively). The accuracy of self-reporting in VIC was the lowest observed in all producer groups, with similarly poor levels of accuracy in both medium and high prevalence areas (around 17% for both).

Table 3.57 shows self-reported OJD prevalence area by verified OJD prevalence area.

Verified prevalence area		Low	Medium	High
Self-reported OJD prevalence area	High	4.7	2.1	<b>22.6</b>
	Medium	4.7	<b>21.7</b>	16.8
	Low	<b>56.9</b>	33.3	17.3
	Other	7.4	2.4	1.9
	Don't know	26.4	40.6	41.4
<b>Total (n)</b>		364	291	208

Table 3.57. Self-reported OJD prevalence area by verified OJD prevalence area. (Data in bold are the proportion of producers who accurately self-reported their OJD prevalence area).

Given the data presented earlier by State, data in Table 3.57 are not surprising and are clearly influenced by the mix of producers from different States that fall into these prevalence areas.

Following this question in the survey, producers were asked how confident they were in their response (self-reported OJD prevalence area). Tables 3.58 summarises these data by State.

	NSW	VIC	QLD	SA	WA	TAS
Yes	84.1	70.2	88.9	88.9	75.2	75.0
No	15.9	29.8	11.1	11.1	24.8	25.0
<b>Total (n)</b>	251	215	54	153	145	52

Table 3.58. Level of confidence in self-reported OJD prevalence area.

Producers were generally highly confident in their earlier responses, generally there is some concordance with the pattern of relative accuracy noted previously, in that SA and NSW

producers generally had greater accuracy (and QLD too, if 'other' responses are included as 'low') and VIC was lower overall, however, the level of confidence appears to be an order of magnitude higher than recorded performance.

These same data cross-tabulated by (verified) OJD prevalence area indicated that confidence in response declined with increasing OJD prevalence area; low = 88.5%; medium = 76.0%; and high = 69.7%).

Producers were asked if their OJD prevalence area changed on January 01 2011. Table 3.59 summarises these responses by State.

	NSW	VIC	QLD	SA	WA	TAS
Yes	17.9	40.5	0.0	20.3	45.5	15.4
No	82.1	59.5	100.0	79.7	54.5	84.6
<b>Total (n)</b>	251	215	54	153	145	52

Table 3.59. Producers' reports of whether their OJD prevalence area changed on 01 January 2011.

As can be seen from Table 3.59, all but those in QLD thought that changes had been made in their States, whereas changes were only introduced in parts of NSW and in all VIC and WA<sup>6</sup>.

In the final questions producers were asked if they felt their current OJD prevalence level reflected the true level of OJD in their district. Table 3.60 summarises these responses by State.

	NSW	VIC	QLD	SA	WA	TAS
Yes	51.2	34.6	62.0	71.6	31.0	40.4
No	21.7	25.7	4.0	11.5	31.0	19.2
Don't know	27.1	39.7	34.0	16.9	37.9	40.4
<b>Total (n)</b>	244	214	50	148	145	52

Table 3.60. Producers' reports of whether they feel their OJD prevalence area reflects the true level of OJD in their district, by State.

Data in Table 3.60 indicate that those in low prevalence States (QLD and SA) are more likely to agree that their current prevalence area is appropriate, and those in WA and VIC, whose prevalence areas changed on 01 Jan 2011 are the least satisfied with the new levels. It also should be noted, though, that there are some high proportions of 'don't know' responses in VIC, QLD, WA and TAS.

<sup>6</sup> Details of 01/01/11 OJD prevalence area changes are detailed on the Animal Health Australia website <http://www.animalhealthaustralia.com.au/programs/johnes-disease/ovine-johnes-disease-in-australia/>, and the NSW I&I website <http://www.dpi.nsw.gov.au/agriculture/livestock/health/specific/sheep/ojd/about/ojd-prevalence-areas-jan2011>.

### ***OJD/SHS status in area: review and discussion***

In this final section of the survey producers were asked about the status of the SHS in their State and about aspects of their current OJD prevalence area. This section enabled both collection of producers' perceived operating conditions, regarding the SHS and OJD status, and also an opportunity to check self-reported responses against actual current OJD prevalence areas; using a range of demographic data provided in the survey, such as State, postcode, LHPAs (NSW) and Shires (VIC).

Around 40% of producers believed that the SHS was mandatory in their area, with larger proportions of producers in SA and NSW believing this to be the case. Producers from these States had already been identified as those with the highest uptake of, and greatest familiarity with, the SHS.

Self-reported OJD prevalence areas were provided by producers and then verified using demographic data provided elsewhere in the questionnaire. Generally, knowledge of current OJD prevalence area was fairly poor, with around 40% of producers in VIC, QLD, WA and TAS reporting that they 'don't know' their current level, and self-reported prevalence being as low as 17% accurate in some areas. Although accurate knowledge was higher in SA and NSW, there were still up to a quarter of producers in these States reporting that they didn't know their prevalence area. In the mixed prevalence States of NSW and VIC there was a clear tendency to underestimate OJD prevalence level; with 13% of producers in NSW self-reporting 'high' when 28% were verified as high, and 12% of producers in VIC self-reporting 'high' when 64% were verified as 'high'. A combination of poor, or patchy, knowledge of OJD prevalence area and a tendency to underestimate disease risk are clearly likely to pose threats to animal health at some level, and to result in potentially risky practice; this is especially concerning given that producers in this sample are from larger and, presumably, more professional commercial operations.

In addition to relatively poor accuracy of knowledge regarding OJD prevalence area, the majority of producers across all States were confident in their self-reported response – above 70% in all States.

OJD prevalence areas were changed in some areas on 01 January 2011. In WA and VIC prevalence areas were raised State-wide: WA moving from low to medium prevalence and VIC low prevalence moving to medium, and medium moving to high. Changes also occurred in NSW. Given that the survey took place in early March it is possible that, despite efforts to raise awareness of these changes by the States' departments of primary industries, many producers were not aware of changes yet. Over half of producers in WA and VIC reported that their prevalence areas did not change (55% and 60%, respectively) and 35% of producers in WA reported their OJD prevalence area as low.

Finally, producers were asked if they felt their current OJD prevalence level reflected the true level of OJD in their district. Those in low prevalence areas (SA and QLD) were generally satisfied (72% and 62% responding 'yes', respectively), whereas those in recently changed States (VIC and WA) were the least satisfied (35% and 31% responding 'yes', respectively). Although not conclusive, this pattern of responses could herald issues of despondency in these groups.

## Factors influencing Producer uptake of the SHS

A logistic regression analysis was undertaken to investigate the relationship between reported uptake of the SHS by producers and the other variables explored as part of this survey. This analysis, essentially, identifies the variables that are the most important in explaining differences in the uptake of the SHS of the producers in the sample.

**Outcome measure:** Uptake of the SHS was used as the outcome measure for the analysis. This variable was calculated from a combination of questions 27 and 28 in which producers reported the proportion of their total purchasing and selling (respectively) in the last two years had included them requesting or supplying an SHS. The method of combination of these two variables into the outcome variable is shown in Table 3.61.

		Proportion of selling supplying a SHS (Q27)				Total (n)
		0%	1-49%	>50%	No selling	
Proportion of buying requesting a SHS (Q28)	0%	1	1	2	1	260
	1-49%	1	1	2	1	26
	>50%	2	2	3	2	236
	No buying	1	1	2	Missing (n=42)	118
Total (n)		165	42	260	173	640

Table 3.61. The combination of use of SHS for buying and selling questions to form the 'uptake of the SHS' outcome variable for analysis.

Using this combination approach resulted in a three level outcome variable as follows:

- 3 = uses the SHS for more than 50% of buying AND selling
- 2 = uses the SHS for more than 50% of buying OR selling
- 1 = does not use the SHS for more than 50% of buying AND selling

**Explanatory variables:** To investigate the uptake of the SHS most of the variables in the survey were included initially in univariate analysis; the main exclusions being open comment/verbatim questions. Of the total of 50 explanatory variables tested, one was quantitative (years of experience in sheep production) and the remaining variables were categorical.

Of these 50 variables, 32 had  $P$ -values  $<0.25$ , the predetermined cut-off level for inclusion of variables into multivariable model. Of these 32, one variable had  $\geq 10\%$  missing observations (did producers tend to buy from the same vendor or a small group of vendors) and was thus excluded. One pair of variables - the years of experience and age had significant correlation (Spearman rank correlation =0.7) but age was excluded because it had a  $P$ -value greater than 0.25. Therefore, 31 variables were tested in the multivariable model of which 11 were retained in the final model; these are detailed in Table 3.62.

Variables	Categories	b	SE(b)	OR	95% CI	P-value
Intercept	>50% buy/sell incl. SHS	-1.98	0.46			
Intercept	>0 but <=50% buy/sell incl. SHS	0.18	0.45			
State						0.146
	NSW	0.00		1.00		
	VIC	-0.29	0.32	0.75	0.40 1.40	
	QLD	-1.03	0.47	0.36	0.14 0.91	
	SA	-0.28	0.25	0.76	0.46 1.23	
	WA	-0.73	0.33	0.48	0.25 0.92	
	TAS	-0.57	0.40	0.57	0.26 1.24	
Prevalence Area (State)						0.3477
	L(NSW) vs. H(NSW)	0.16	0.63	1.17	0.60 2.31	
	M(NSW) vs. H(NSW)	1.13	0.34	3.09	0.84 12.13	
	M(VIC) vs. H(VIC)	0.24	0.36	1.28	0.63 2.60	
SHS mandatory in State						<0.001
	No	0.00		1.00		
	Yes	1.03	0.23	2.80	1.78 4.43	
	Yes, with exceptions	0.14	0.37	1.15	0.55 2.39	
	Don't know	0.04	0.29	1.04	0.58 1.84	
Confident can complete SHS accurately (Q32_02)						0.005
	N+D+SD	0.00		1.00		
	SA+A	0.80	0.28	2.22	1.28 3.92	
Agent doesn't request SHS when purchasing (Q32_07)						0.005
	N+D+SD	0.00		1.00		
	SA+A	-0.64	0.22	0.53	0.35 0.80	
Can decide on health status by inspecting myself at sale (Q32_10)						0.003
	N+D+SD	0.00		1.00		
	SA+A	0.61	0.18	1.84	1.29 2.63	
Don't complete SHS because I don't have to (Q32_11)						<0.001
	N+D+SD	0.00		1.00		
	SA+A	-1.37	0.22	0.25	0.16 0.39	
Use points system (ABC scores) to guide purchases (Q32_17)						<0.001
	N+D+SD	0.00		1.00		
	SA+A	0.67	0.18	1.96	1.39 2.78	
Gender						<0.001
	Male	0.00		1.00		
	Female	1.02	0.29	2.77	1.57 4.94	
Number of sales not for slaughter in last 2 years						<0.001
	>8	0.00		1.00		
	4-8	-0.27	0.26	0.76	0.45 1.27	
	<4	0.01	0.22	1.01	0.65 1.58	
	0	-1.88	0.25	0.15	0.09 0.25	
Number of purchases onto property in last 2 years						<0.001
	>4	0.00		1.00		
	2-3	0.41	0.32	1.51	0.80 2.86	
	<2	0.08	0.26	1.09	0.65 1.83	
	0	-1.34	0.32	0.26	0.14 0.49	

Table 3.62. Final multivariate logistic regression model for factors associated with uptake of the SHS by producers.

Results of logistic regression indicated that nine variables were significantly associated with levels of the uptake of the SHS, they were: whether the SHS was considered mandatory in the State, gender, the number of purchases onto property in the last two years, the number of sales other than to slaughter in the last two years, and five attitudinal variables. These latter variables were; confidence that the producer could complete the SHS accurately, having an agent who doesn't request the SHS when the producer is purchasing, feeling able to decide on the health status of sheep by inspecting them at sale, not completing the SHS because the producer doesn't have to, and using the points system (ABC scores) to guide purchases.

Figure 3.18 graphically presents the results of the logistic regression model.

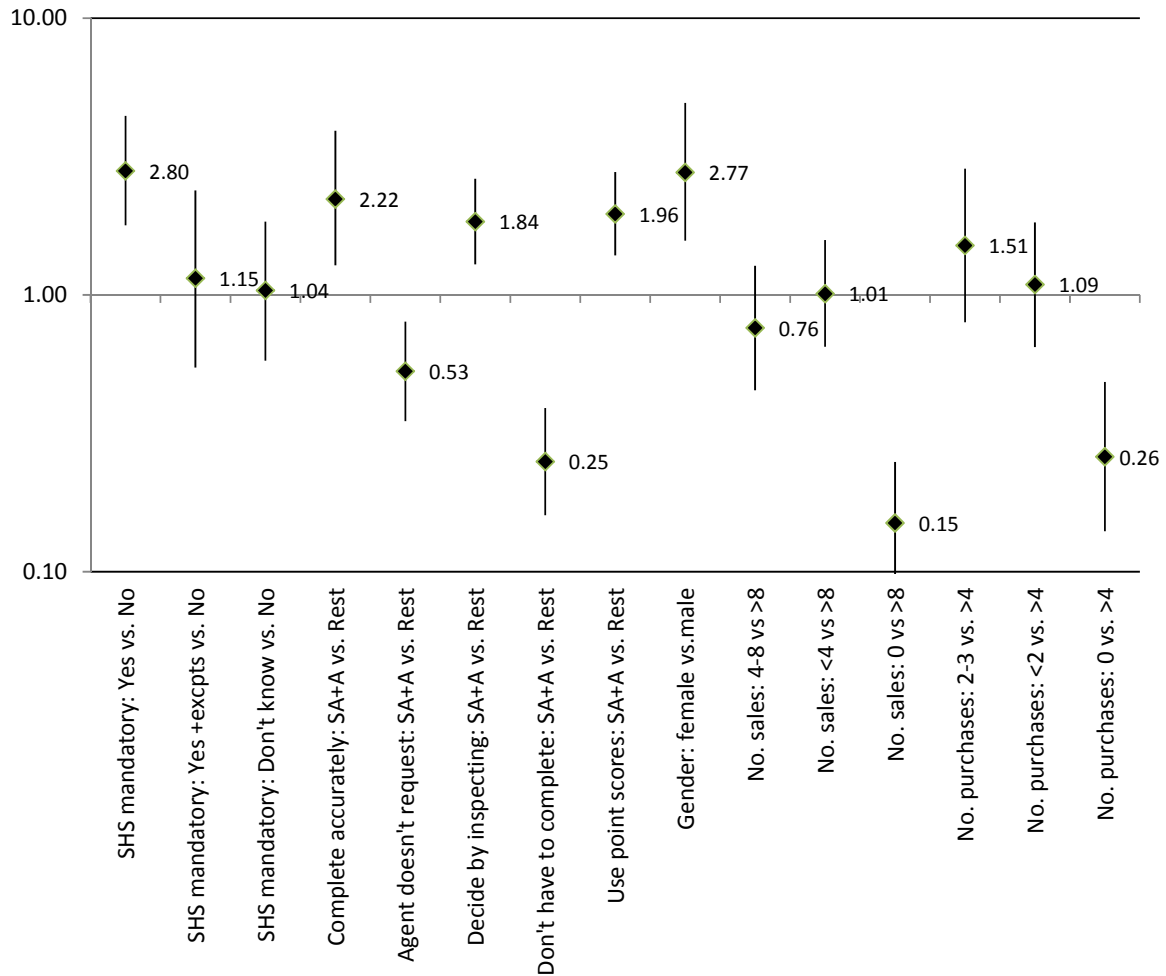


Figure 3.18. Results of the multivariate logistic regression model, with odds ratios shown. (Markers above the reference line (with  $OR > 1.0$ ) indicate that the variable is significantly associated with greater uptake of the SHS and those below (with  $OR < 1.0$ ) indicate that the variable is significantly associated with lower uptake of the SHS.)

Final multivariate model data presented in Figure 3.18 clearly show the direction and effect sizes of associations with the explanatory variables. These findings are summarised below.



Increased uptake of the SHS was associated with

- being in a State where the SHS was mandatory,
- being a female producer,
- being confident that you can complete the SHS accurately,
- feeling confident that you can decide on the health status of sheep by inspecting them at sale, and
- using the points system (ABC scores) to guide purchases.

Decreased uptake of the SHS was associated with

- agreeing that you don't complete it because you don't have to,
- having your agent not request the SHS when you purchase sheep,
- making no sales other than to slaughter in the last 2 years, and
- bringing no purchased sheep onto your property in the last two years.

As the final model is tested in presence of all the significant variables, this identifies the key factors that are linked with uptake of the SHS and, by their omission, those that are not linked to uptake. These results suggest that factors such as State, OJD prevalence area, current management practices, enterprise type, and demographic factors (other than gender) are not key factors linking to uptake here.

In conclusion, clearly some factors that relate to the general operating climate, such as whether the SHS is mandatory and whether agents are requesting the SHS for producers influence uptake. Similarly not making purchases of sheep onto property and not selling, other than to slaughter, are also linked to lower uptake. Most of the attitudinal statements that link to higher uptake seem straightforward; those who use the ABC scores to guide purchases and those who feel able to complete the SHS accurately are likely to be using the SHS more. It is not clear, though, why producers who feel that they are able to assess the health of sheep by inspecting themselves would also be more likely to use the SHS. Possibly these producers are generally more confident or knowledgeable regarding sheep health and also see the benefit of the additional assurance that the SHS provides. Finally, female producers are more likely to use the SHS than male producers, again, it is not obvious why this would be a major factors in SHS uptake; all producers in the sample are the person primarily responsible for animal health management decisions, possibly females are more actively engaged in health management or are motivated by the additional assurance of the SHS.

## 4. AGENT SURVEY RESULTS

The results are presented in sections that reflect the structure of the survey in Figure 2.2, although the demographics are reported as part of the initial sample description section.

### Response rate

A total of 300 survey interviews were conducted between 23<sup>rd</sup> February and 10 March 2011. A total of 2030 potential livestock agents' telephone numbers were identified and 932 contacts were made. However, 194 were invalid (e.g. wrong numbers, retired, deceased) and 61 did not meet the target sample description, e.g. did not work with sheep or were not livestock agents. Of the remaining 677 eligible contacts 377 refused to take part in the interview. This resulted in a response rate of 44.3%. The mean length of the survey interview was 15 minutes.

### Sample description: Demographics

Of the 300 agents interviewed 295 were male (98.3%) and five were female (1.7%). A breakdown of the sample by age and by State is shown in Tables 4.1 and 4.2, respectively. The majority of agents were aged 35-65 and most were based in NSW and Victoria.

Age	Frequency	Percent
18-24	9	3.0
25-34	45	15.1
35-44	77	25.8
45-54	75	25.1
55-64	77	25.8
65 and over	16	5.4
Missing	1	-

Table 4.1. Sample breakdown by age.

State	Frequency	Percent
NSW	114	38.0
VIC	77	25.7
QLD	42	14.0
SA	33	11.0
WA	23	7.7
TAS	11	3.7

Table 4.2. Sample breakdown by State

## Experience

Agents were asked several questions about their level of experience and the general nature of their sheep work. Mean years of experience as a sheep livestock agent was reported as 28 years (median, 20) with a mean of 23 years experience operating in the current district (median, 12). With regard to role within agency, Table 4.3 summarises these data.

Role	Frequency	Percent
The owner/licensee of a sole agency	38	12.7
The owner/licensee of an agency employing one or more agents	64	21.3
A senior agent	165	55.0
A junior agent	33	11.0

Table 4.3. Role within agency.

Agents were asked about their client base; the size of their client base, the principal enterprise type of their client base and proportion of their work that was in buying and in selling sheep. The mean number of clients was 91 (median = 50). Table 4.4 summarises the breakdown of client principal enterprise type for the agent sample.

Enterprise type	Frequency	Percent
Wool - Stud	6	2.0
Wool - Commercial	48	16.0
Meat - Stud	0	0.0
Meat - Commercial	235	78.3
Live export	11	3.7

Table 4.4. Principal enterprise type of client base.

As can be seen from Tables 4.3 and 4.4, the majority of agents were in senior agent roles and the majority of their clients were principally working in commercial meat enterprises. No agents had a client base made up principally of meat stud enterprises and very few had clients with wool studs as their principal enterprise type.

When asked about the balance of their sheep work 27% was attributed to buying and 73% to selling. Table 4.5 summarises the distribution of the selling work of the agents in the sample (buying work being the reciprocal).

Proportion of sales work (%)	Frequency	Percent
0-25	2	0.7
26-50	6	2.0
51-75	127	42.3
76-100	165	55.0

Table 4.5. Distribution of the proportion of sales work of the agent sample.

## Operating environment

In this section agents were asked about where they conduct their sheep work, and how much of it involves buying or selling direct to slaughter. They were also asked how much of their buying and selling involved the use of a SHS.

Agents were asked to estimate what proportion of their sheep work was conducted in different types of locations/environments; in saleyards, in private sales, in on-farm stud sales and online. Figure 4.1 summarises the overall distribution of sheep work locations.

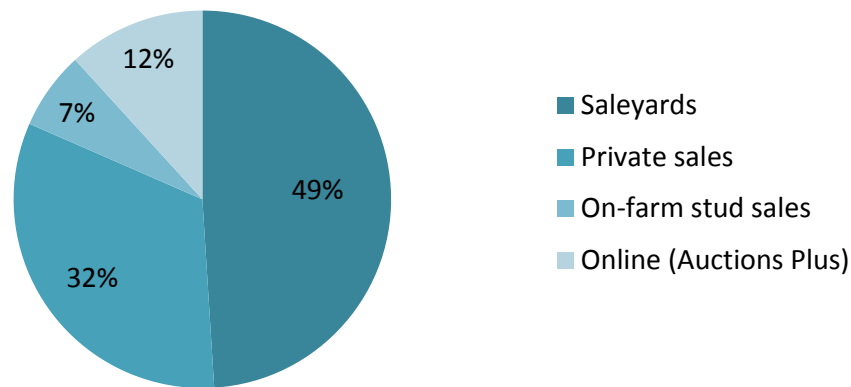


Figure 4.1. Breakdown of sheep work locations.

In addition, data were analysed to categorise agents in terms of where the *majority* of their work was undertaken: if agents indicated that 50% or more of their work was undertaken in one of these location types then that was categorised as their principal operating location, if no single location type was identified as a principal location ( $\geq 50\%$ ) then this was recorded as 'mixed' location. Table 4.6 summarises this breakdown.

Principal locations	Frequency	Percent
In saleyards	154	51.3
In private sales	71	23.7
On-farm stud sales	13	4.3
Online (Auction Plus)	26	8.7
Mixed Location	36	12.0

Table 4.6. Breakdown of sample by principal operating location.

Clearly the majority of agents tended to operate principally in saleyards, followed by private sales.

Agents were asked to identify approximately what proportion of their buying and selling work involved animals going direct to slaughter. The distribution of selling and buying direct to slaughter is summarised in Tables 4.7 and 4.8 respectively.

Sales (%)	Frequency	Percent
0-25	107	36.3
26-50	64	21.7
51-75	62	21.0
76-100	62	21.0
Missing	5	-

Table 4.7. Proportion of sheep sold in the last year direct to slaughter.

Buying (%)	Frequency	Percent
0-25	230	76.9
26-50	32	10.7
51-75	15	5.0
76-100	22	7.4
Missing	1	-

Table 4.8. Proportion of sheep bought in the last year direct to slaughter.

### **Use of the Sheep Health Statement (SHS)**

Agents were asked to estimate what proportion of their total selling and total buying in the preceding year had involved the use of a SHS. Overall 53.0% of selling and 55.7% of buying included a SHS. Tables 4.9 and 4.10 summarise the breakdown of the proportion of sales and purchases with the SHS for the whole sample and these data are presented in Figure 4.2.

Sales (%)	Frequency	Percent
0-25	120	40.0
26-50	36	12.0
51-75	19	6.3
76-100	125	41.7

Table 4.9. Proportion of sales in preceding year that included use of a SHS.

Buying (%)	Frequency	Percent
0-25	119	39.7
26-50	20	6.7
51-75	14	4.7
76-100	147	49.0

Table 4.10. Proportion of purchases in the preceding year that included use of a SHS.

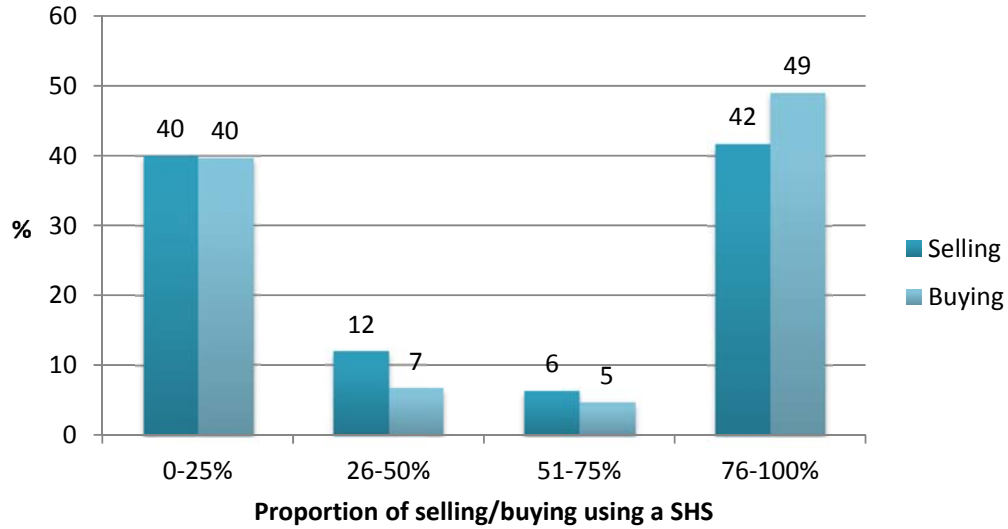


Figure 4.2. Proportion of sheep work in the preceding year that included use of a SHS.

Data presented in Tables 4.9 and 4.10 and Figure 4.2 clearly indicate that for most agents use of the SHS tends to be rather ‘all or nothing’ with 80-90% of agents using the SHS for transactions either less than 25% or more than 76% of the time.

### Client base and standing within it

In this section agents were asked about their relationship with their clients; their clients’ reliance on them for advice, the type of advice provided to clients, and their perceived degree of influence on their clients.

When asked about their relationship with their client base most agents (91%) reported that, over the last two years, they had an established working relationship with more than 76% of their clients. Table 4.11 summarises these data.

Client base (%)	Frequency	Percent
0-25	4	1.3
26-50	9	3.0
51-75	14	4.7
76-100	273	91.0

Table 4.11. Proportion of client base for which agents felt they had an established working relationship.

Agents were asked about the nature of the sheep production enterprise of the majority of their client base. Table 4.12 summarises these data.

Sheep enterprise type	Frequency	Percent
Primary producers with sheep production as their primary source of income	171	57.0
Primary producers with sheep production as their secondary source of income	127	42.3
Hobby/leisure farmers	2	0.7

Table 4.12. Sheep enterprise type for majority of client base.

Data in Table 4.12 suggest that the majority of agents' client bases comprise primary sheep producers (57%), although there was strong representation from secondary sheep producers too (42%).

When asked about the degree to which agents felt that clients relied on them for advice about the health of sheep they are planning to buy more than 50% indicated 'a great deal'. Figure 4.3 summarises these responses.

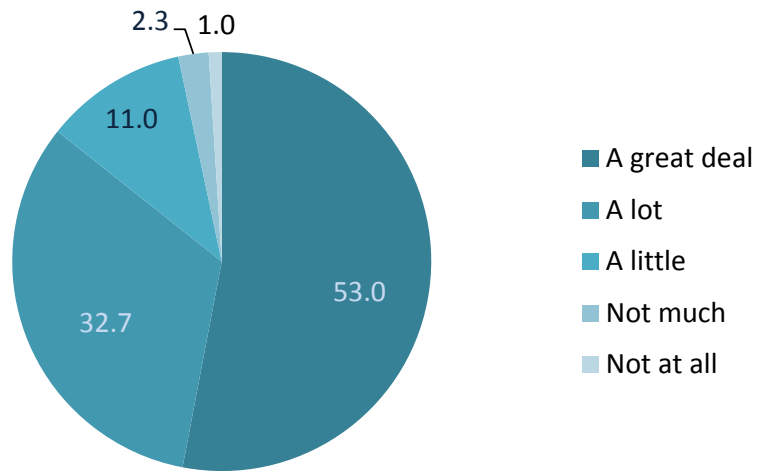


Figure 4.3. Agents' perceptions of the degree of clients' reliance on them for advice about the health of sheep they're planning to buy.

Agents were asked what proportion of their clients they thought relied solely on their judgment to purchase disease-free sheep. The majority of agents (57%) felt that 76-100% of clients relied solely on their judgment in this regard. Table 4.13 summarises the responses.

Proportion of clients (%)	Frequency	Percent
0-25	41	13.7
26-50	48	16.0
51-75	39	13.0
76-100	172	57.3

Table 4.13. Proportion of clients relying solely on the agent's judgment to purchase disease-free sheep.

In the following question agents were asked how frequently they advise producers about a range of issues, Figure 4.4 summarises these data and frequency tables are included in Appendix 6a (Q22).

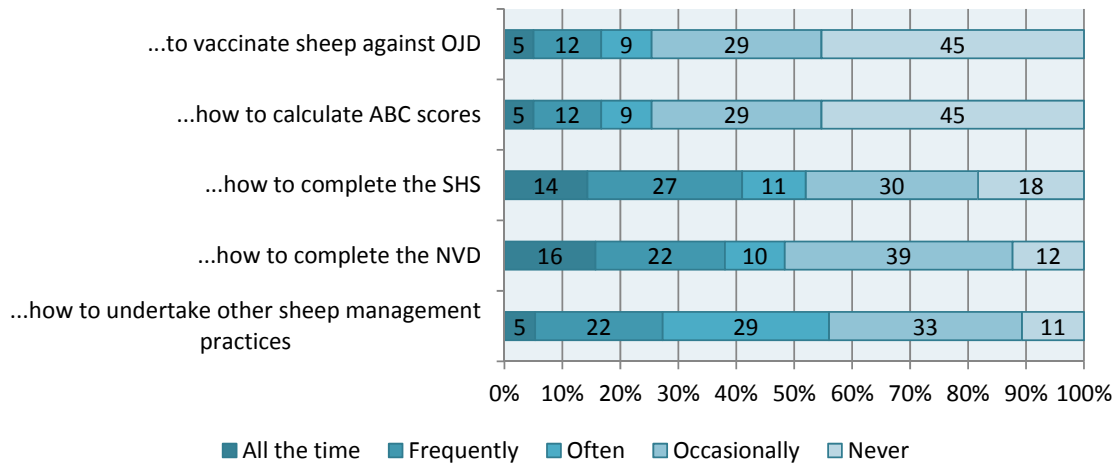


Figure 4.4. Frequency of different types of advice being given to producers by agents.

Overall less frequent advice was given to producers about vaccinating for OJD or for calculating ABC scores, than the other types of advice, with 45% of agents reporting that they ‘never’ provide this advice. By comparison, 14-16% of agents reported that they provided advice to producers about how to complete the SHS and the NVD ‘all the time’, and around half reported providing these types of advice ‘often’ or more frequently (52% and 48%, respectively). Advice about other sheep management practices was reported to be given to producers ‘often’ or more frequently by more than half of agents (56%).

Finally in this section, agents were asked to give an overall indication of the degree of influence they felt they had on producers. These data are summarised in Figure 4.5.

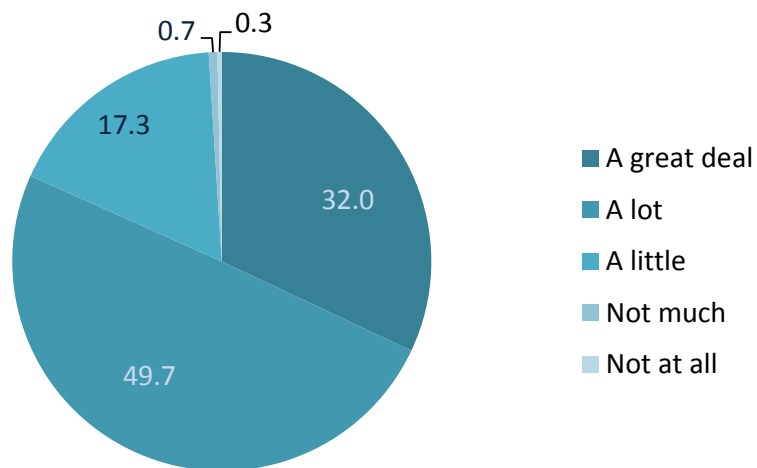


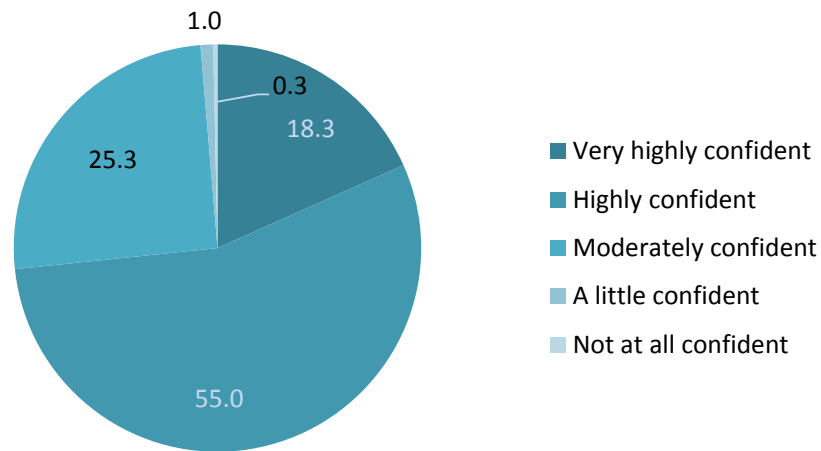
Figure 4.5. Overall degree of influence agents report they have on producers.



It is clear from Figure 4.5 that agents believe they have a high degree of influence on producers, with just under a third indicating they have a 'great deal' of influence and around half indicating they have 'a lot' of influence.

## Perceived disease threats

This short section of the survey asked agents about their understanding of current disease threats and sheep health issues and asked about the level of perceived risk of various sheep diseases in their area. Figure 4.6 presents responses regarding how confident agents were that they had a good understanding of the current disease threats and health issues of sheep that they typically buy/sell.



*Figure 4.6. Confidence in good understanding of sheep disease threats/health issues.*

As can be seen from Figure 4.6, agents were generally highly confident that they had a good understanding of current sheep disease threats, with just under three quarters (73%) reporting that they felt either highly or very highly confident.

To gain an understanding of current perceived disease risk to sheep in the area, agents were asked to rate the risk of the four disease threats covered by the SHS. Figure 4.7 summarises these findings and supporting frequency tables are included in Appendix 6b (Q27).

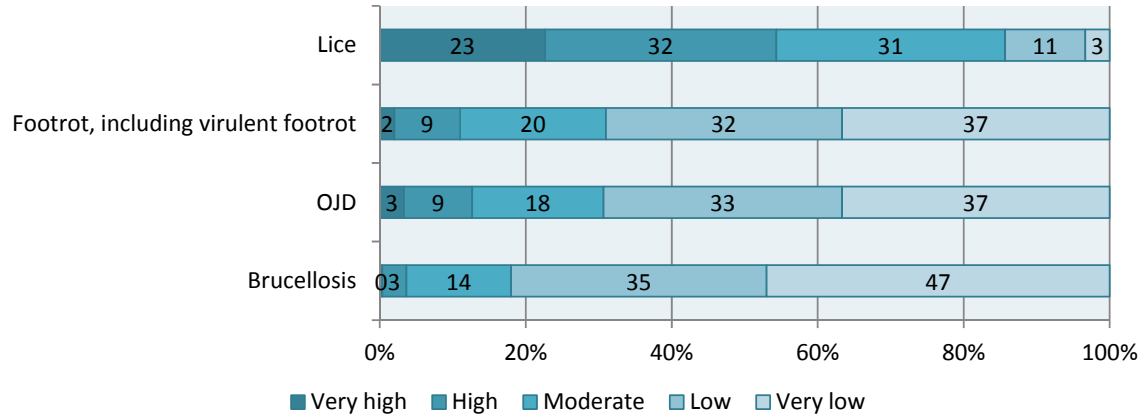


Figure 4.7. Level of disease threat to sheep in area.

Overall, the level of threat for lice was regarded as higher than any of the other disease threats, with over half of the agents (55%) reporting this as either a ‘high’ or ‘very high’ risk in their area. By comparison, the risk of brucellosis was rated as the lowest risk overall. The risk profiles for footrot and OJD were very similar for the national agent group as a whole, with around 30% of agents rating this risk as ‘moderate’ or higher.

### Sheep health and use of the Sheep Health Statement (SHS)

In this final larger section of the survey interview agents were asked a wide range of questions regarding use of the SHS, their views on producers’ knowledge and perceptions of the SHS, their own views on the SHS, barriers and drivers to use of the SHS, and the degree to which they encourage or advocate the use of the SHS.

Agents were asked what proportion of their sheep work was conducted in locations where the SHS was not required. Table 4.14 summarises the responses

SHS not required (%)	Frequency	Percent
0-25	117	39.0
26-50	37	12.3
51-75	33	11.0
76-100	113	37.7

Table 4.14. Proportion of sheep work conducted at locations where the SHS is not required.

As can be seen from Table 4.14, almost half of the agent sample (49%) conducts more than half of their sheep work in locations where the SHS is not required.

Agents were then asked how much of the SHS their clients tended to complete. Just under three quarters (71%) reported that their clients completed all of it, 16% reported that clients completed just the ABC score, and 12% reported that their clients tended to partially complete the SHS by completing other sections of it.

The next question was a multi-part question which asked agents questions about producer knowledge and attitudes to the SHS. These data are summarised in Figure 4.8 and supporting frequency tables are included in Appendix 6c (Q33).

Generally, do you think producers...

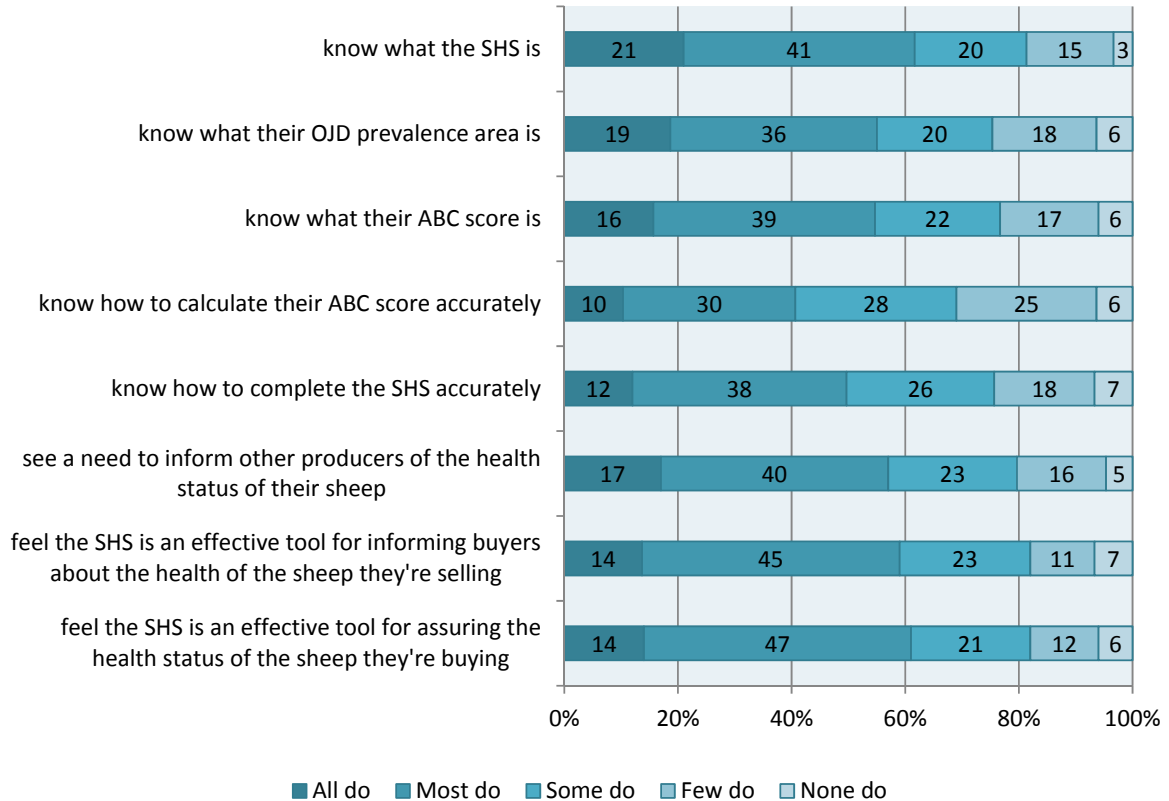


Figure 4.8. Agents' views of producer knowledge and attitudes to the SHS.

Overall, 62% of agents felt that most or all producers know what the SHS is, with doubt cast over producer SHS-awareness being expressed by a further 38% of agents. Over half of agents felt that most producers know their OJD prevalence area and what their ABC score is; but only 40% felt that most producers knew how to calculate their ABC score accurately. Half the agents (50%) believed that most producers know how to complete the SHS accurately. Despite a mixed set of perceptions on producer knowledge and accuracy in relation to the SHS, around 60% of agents felt that most producers believed the SHS was an effective tool for informing and assuring buyers, and also felt that there was a need to provide information to others about the health status of their sheep.

The following four questions in this section of the survey interview were open comment questions in which agents were asked what they thought the main drivers and barriers to the use of the SHS were for producers, when buying and selling. Some pre-coded responses were supplied (but not read to respondents) based on producer data from the DPI VIC SHS report findings, and agents were encouraged to provide up to three answers to provide more depth/insight into these issues and to avoid collection of only the first 'obvious' response,

such as drivers for use being ‘because they have to complete it’ or reasons for non-use being ‘they can’t be bothered’.

Currently analysis has been based on simple content coding. As expected, many of the pre-coded responses were the ones most frequently suggested by agents. Figures 4.9 – 4.12 summarise the top ten most frequently mentioned main drivers that agents believe motivate producers’ use of the SHS when selling and buying, and the top ten reasons why agents believe producers don’t use the SHS when buying and selling.

What do you think is the main driver that motivates producers to complete the SHS when selling sheep?

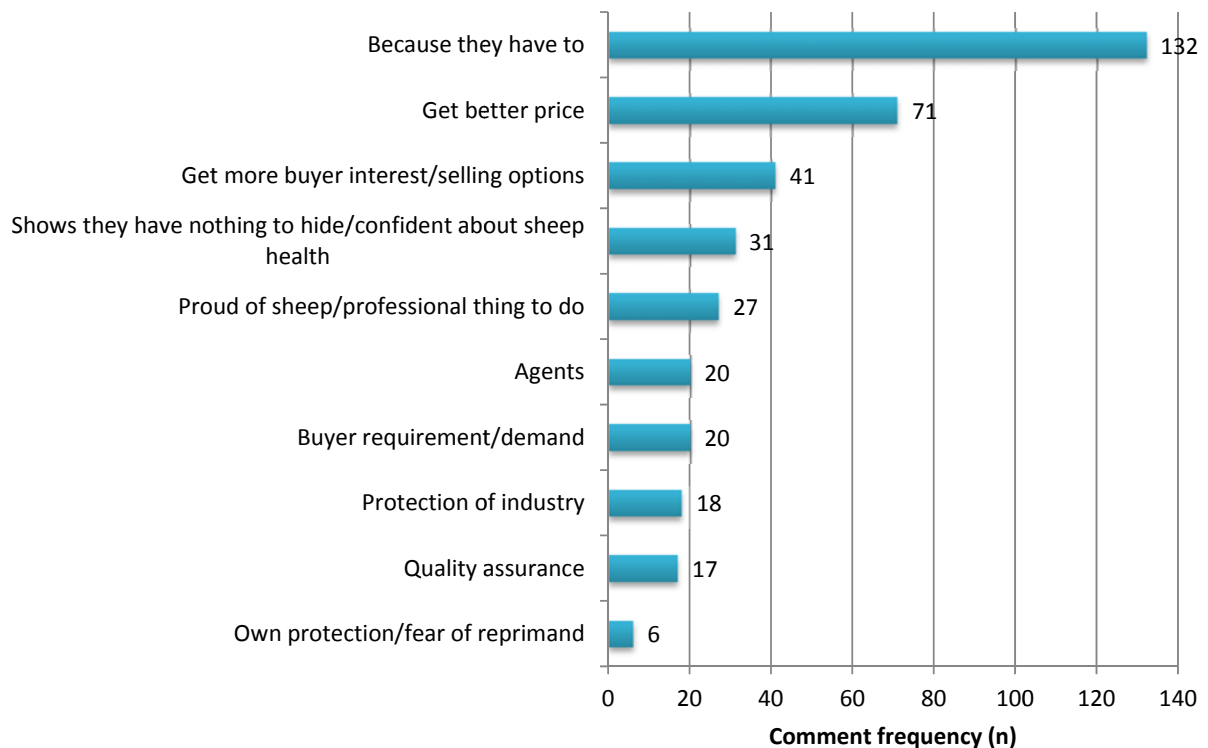


Figure 4.9. The ten most frequently given suggestions, by agents, as the main drivers for why producers complete the SHS when selling sheep.

In total 414 comments were recorded. Data in Figure 4.9 indicate that overwhelmingly, the main reason that agents think producers complete the SHS when selling sheep is because they have to. However, after this, it is interesting to note that more positive motivations such as the SHS resulting in a better price and getting more buying/selling options are also considered relevant. Issues of openness, honesty and professionalism are also mentioned; in comments regarding the use of the SHS as a sign of professionalism and showing that they have nothing to hide. There is also evidence that agents feel that they are also key drivers in motivating producers to use the SHS.

In addition to the comments summarised in Figure 4.9, there were a small number of ‘don’t know’ responses given (n=9). Recorded comments were generally very brief. To provide

some further detail and depth of understanding of the points being raised, a number of example comments are shown below: *“fear of disease, keep it clean”, “indicates what treatments they’ve had and their status. They’re supporting their products”, “assurance and protection”, “to check on and prevent diseases”, “to protect their industry”, “us agents – we prod them”, “agents telling them to do it”, “buyers want it”, “guard against financial repercussions”, “requirements from meat companies”, “requirements to sell through saleyards”, “young producers today are pretty well aware that it doesn’t help industry to spread disease”.*

What do you think is the main driver that motivates producers to ask for a SHS when buying sheep?

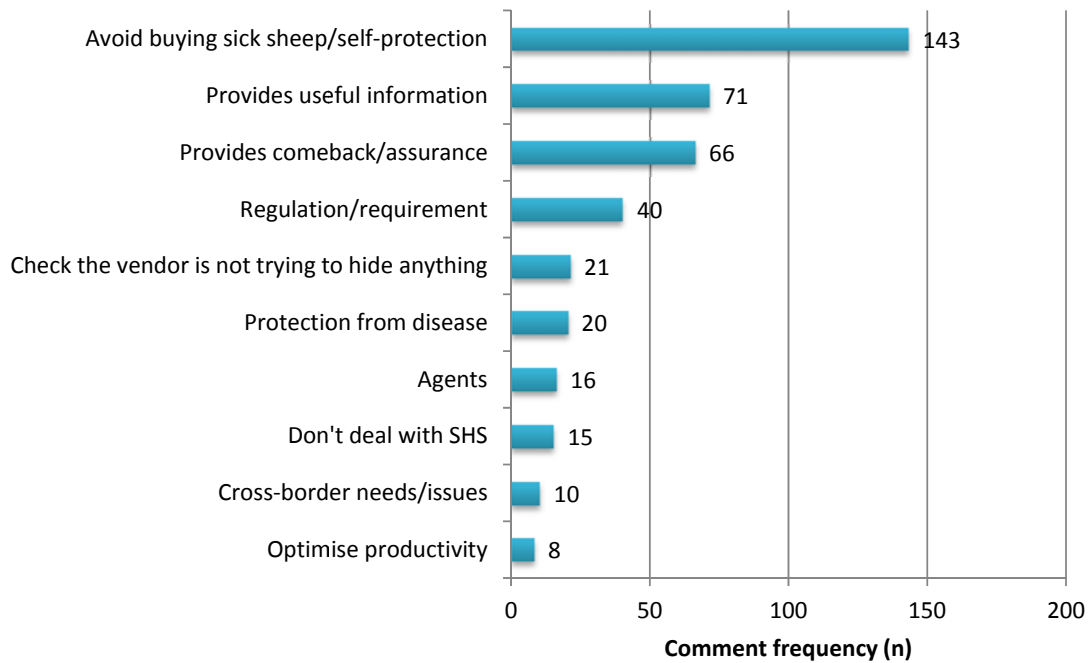


Figure 4.10. The ten most frequently given suggestions, by agents, as the main drivers that motivate producers to ask for the SHS when buying sheep.

A total of 449 comments were coded, and 16 ‘don’t know’ comments were recorded. Results of the comments coding indicate that the main driver that agents think motivates producers to use the SHS when buying sheep is the avoidance of buying sick sheep and the ability to use the SHS for self-protection in this way. This finding is reassuring. In addition, positive reasons such as the ability of the SHS to provide useful information for the buyer and to give assurance are also noted. The reasons of regulation/mandatory requirement are raised, but less prominently than previously as a driver to complete the SHS when selling. Again, agents noted their role in driving uptake of the SHS and additional issues, such as cross border trade are also raised.

As before a few comments are provided here as examples of those comments made by agents: *“in areas close to the border it is of higher importance, as ABC scores drop across Vic and WA borders, so it is of high importance as we’re in SA”, “not many ask at this stage – it’s provided”, “not going to get as much money for diseased animals”, “confidence in what*

*they're purchasing*", "cross border require it", "increase productivity in their sheep", "make it mandatory", "marketing tool – it works two ways", "protecting their own income", "so they can get them into South Australia", "the agent tells them", "general talk around the yards, word of mouth", "competition", "compliance", "flock protection", "safeguard themselves against disease", "they don't want to lose their rating", "to sell they've got to have it".

What do you think is the main reason that producers don't complete the SHS when selling sheep?

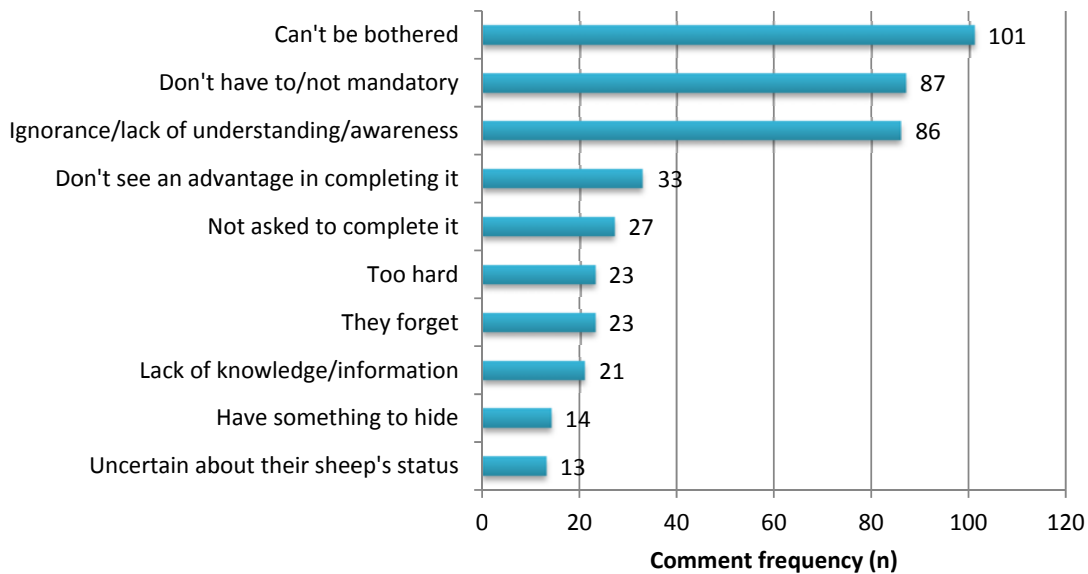


Figure 4.11. The ten most frequently given suggestions, by agents, as the reason that producers don't complete the SHS when selling sheep.

In total 487 individual comments were recorded. As can be seen from the data in Figure 4.11 the most commonly given reasons for why producers don't complete an SHS when selling sheep were that they couldn't be bothered or that they didn't have to. Looking beyond those reasons, there was a clear indication that agents felt producers were ignorant about the SHS; a lack of awareness of it or a lack of understanding of its use and, indeed, that they didn't see there was an advantage in them completing it. There was also a suggestion that producers might not complete the SHS if they had something to hide or if they were uncertain about the health status of their sheep.

In addition to the comments shown in Figure 4.11, a further 25 'don't know' comments were recorded. Also, eight comments were recorded in which agents reported that all their producers complete the SHS and/or that they were unfamiliar with producers not completing the SHS.

As mentioned earlier, comments were generally brief but some example comments are given here for context: "pure ignorance, we instruct them to fill it out", "not aware of it because requirements have not been widely published", "they all do it, if they don't they can't sell", "do not want people to know they have a problem", "lack of understanding of what it is", "the people who want to do their job properly fill it in", "they do not realise it is mandatory",

*“they either forget, or don’t know how”, “a lot of them are illiterate”, “they don’t know about it, once they are told they will participate”, “possibly because they know they have a problem and also they do not realise the importance of the documentation”.*

What do you think is the main reason that producers don't ask for the SHS when buying sheep?

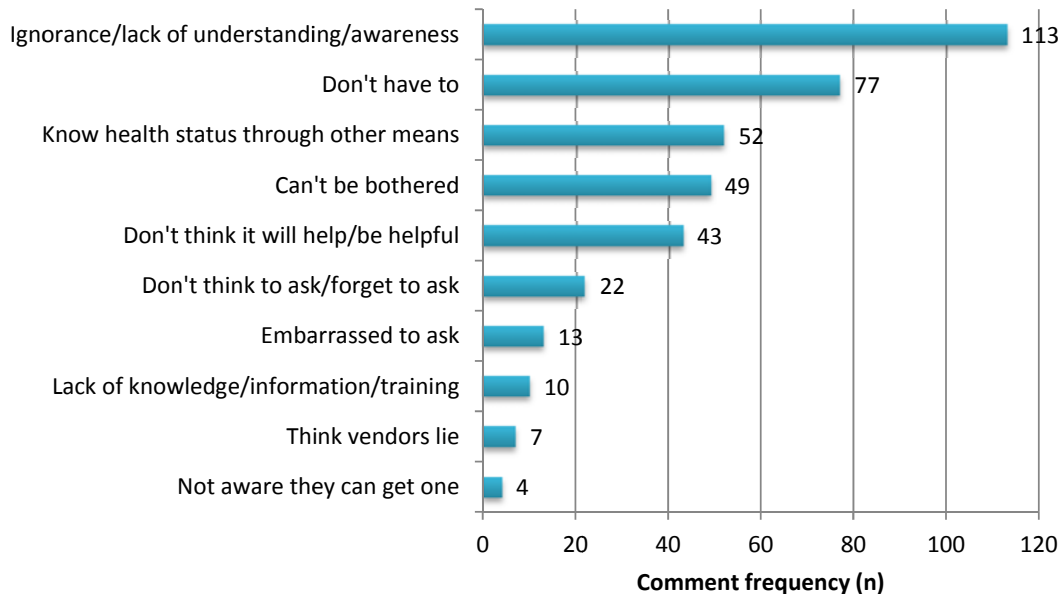


Figure 4.12. The ten most frequently given suggestions, by agents, as the reason that producers don't ask for the SHS when buying sheep.

A total of 475 comments were recorded in response to this question. As can be seen in Figure 4.12 by far the most frequent comment was that there was a lack of awareness or ignorance of the SHS and this was the main reason that producers did not request it when purchasing sheep. Other possible reasons were that there was no requirement to request the SHS, that producers couldn't be bothered to ask for it or that they simply forget to ask or don't think about asking for one. A number of agents suggested that producers knew the health status of the sheep they were buying through other means. It is not clear what these 'other means' are, but presumably many may have direct contact and/or close or established working relationships with vendors and feel that they are sufficiently well-informed.

Again, a number of 'don't know' responses were recorded (n=55) and a further 17 responses were recorded in which agents suggested that all producers *did* ask for the SHS or always used the SHS and that this was not an issue for them.

Example comments are provided here to give an indication of the types of comment being made: *“They do not realise these regulations are in place. Until we began requesting them people did not know”, “doesn't apply, because breeders here all get the SHS”, “don't use them up here, so don't ask for it”, “they should ask, but they don't”, “lack of understanding of benefits”, “the agent is not on the ball to inform them”, “the buyer doesn't think to ask for it”, “they do not know about it – the SHS should be combined with the NVD”, “they have never*

*done it*, “unaware of forms being available”, “don’t realise they can get one”, “last thing that pops into their mind”, “most of them are totally ignorant that they should be providing one because it hasn’t been promoted properly – been very poorly orchestrated”, “not aware of it, and agent doesn’t help”, “they are not used to it”, “we get it every time, so there’s no answer to this question”.

Agents were asked a range of questions about their attitudes towards the SHS, Figure 4.13 summarises these data and supporting frequency tables are included in Appendix 6d (Q43).

What is your level of agreement with the following statements about the SHS?

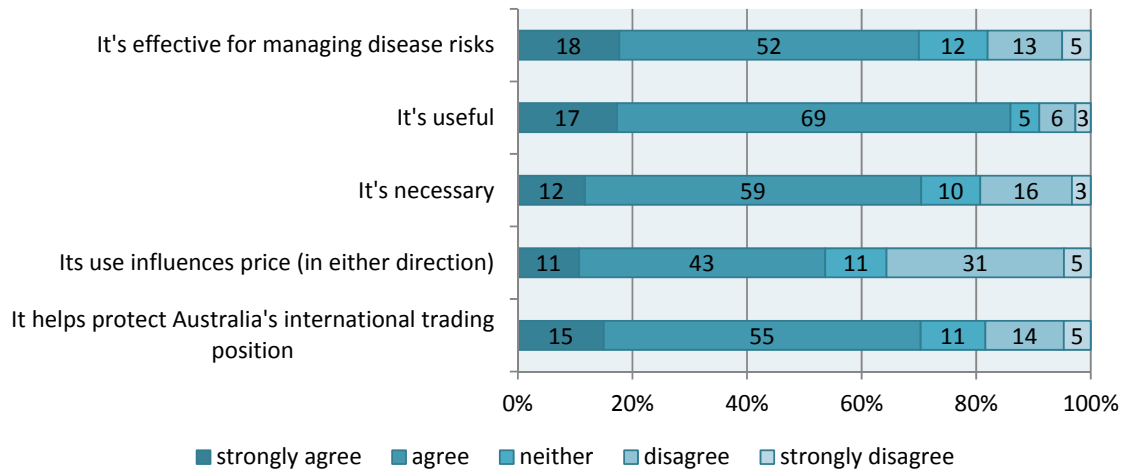


Figure 4.13. Agents’ views of the SHS.

Data presented in Figure 4.13 show that agents’ are overwhelmingly supportive of the SHS with 86% agreeing it is useful, 71% agreeing it’s necessary, and 70% agreeing that it’s effective for managing disease risks. A similarly high proportion (70%) also agrees that it helps protect Australia’s international trading position. With regard to whether it influences price, just over half (54%) agree with this statement.

The final few questions dealt more directly with agent advocacy of the SHS. Agents were asked how often they encourage clients to use the SHS, Figure 4.14 summarises these results and supporting frequency tables are included in Appendix 6e (Q44).



How often do you encourage your clients to...

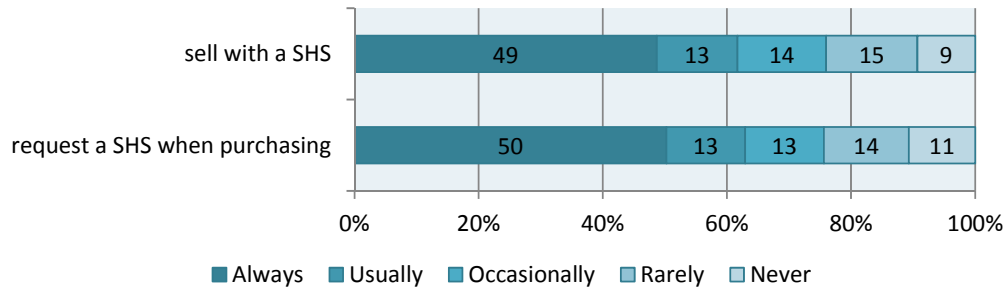


Figure 4.14. Extent to which agents encourage use of the SHS.

As can be seen from Figure 4.14 around half of the agents report that they always encourage clients to sell with a SHS and request a SHS when purchasing. However, around a quarter rarely or never encourage its use.

Agents were asked how often they request a SHS when purchasing sheep on behalf of their clients. Responses are shown in Figure 4.15. Over 60% indicate they usually or always request a SHS when purchasing on behalf of clients.

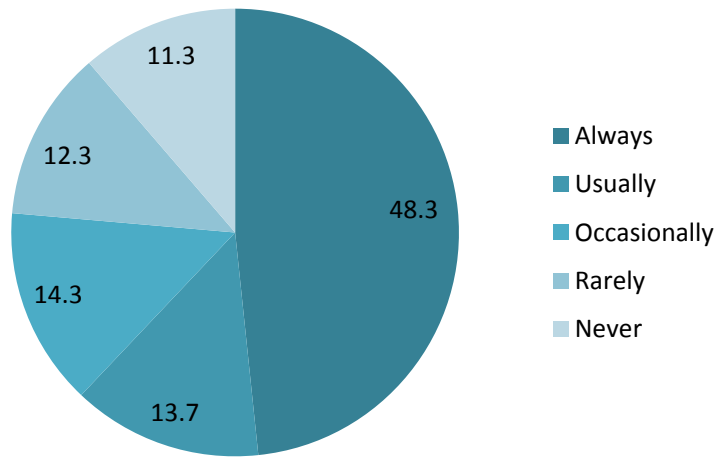


Figure 4.15. How often agents request a SHS when purchasing sheep on behalf of their clients.

When asked ‘do you only request a SHS when your clients request you do so’ 42% of agents said yes they did and 58% said no.

In the final question agents were asked what they thought they could do to influence producers’ use/uptake of the SHS. This question was an open comment question. In total 429 comments were coded into nine main content area categories. Figure 4.16 summarises these data.

In your opinion, what could agents do to influence producers' use/uptake of the SHS?

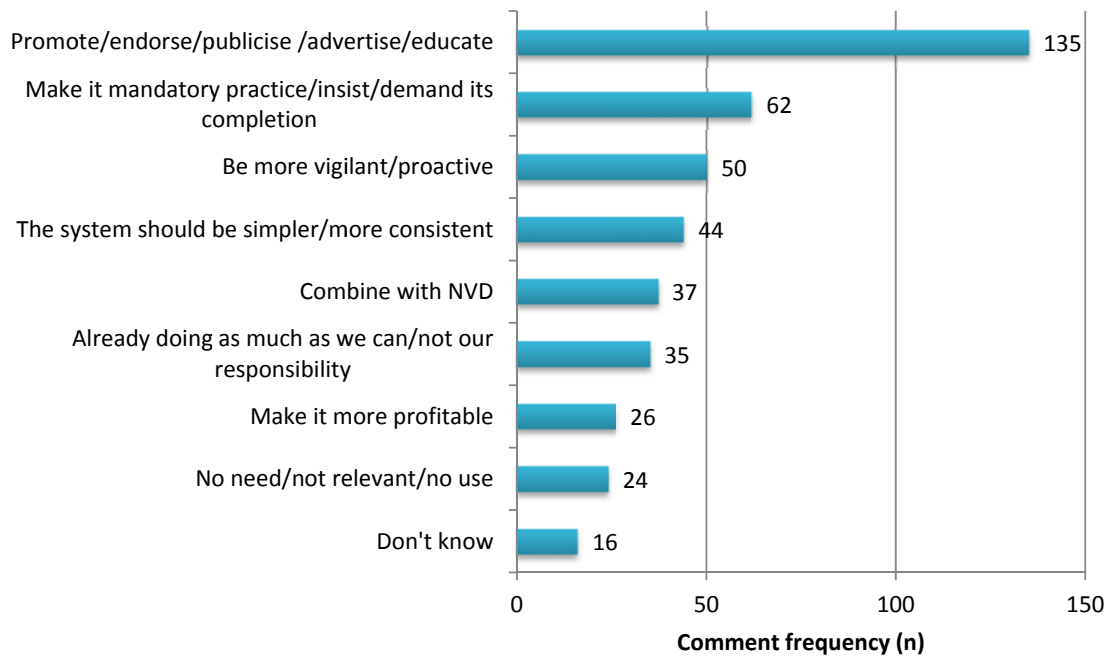


Figure 4.16. What agents could do to influence producers' use/uptake of the SHS.

As indicated in Figure 4.16, the largest group of suggestions was around further promotion and education of the SHS. Quite a number of comments asked for the system to be made simpler and many specifically asked for the SHS paperwork to be combined with the NVD into a single form. A full set of comments to this question is included in Appendix 7a (Q47).

### Factors influencing Agent uptake of the SHS

To investigate the relationship between reported uptake of the SHS by agents and other variables explored as part of this survey a logistic regression analysis was undertaken. This analysis, essentially, identifies the variables that are the most important in explaining differences in the uptake of the SHS of the agents in the sample.

**Outcome measure:** Uptake of the SHS was used as the outcome measure for the analysis. This variable was calculated from a combination of questions 16 and 17 in which agents reported the proportion of their total selling and buying (respectively) in the last year that included use of the SHS. The method of combination of these two variables into the outcome variable is shown in Table 4.15.

		Proportion of selling supplying a SHS (Q27)			Total (n)
		0%	1-49%	>50%	
Proportion of buying requesting a SHS (Q28)	0%	1	1	2	260
	1-49%	1	1	2	26
	>50%	2	2	3	236

	Total (n)	16	42	260	640
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Table 4.15. The combination of use of SHS for buying and selling questions to form the 'uptake of the SHS' outcome variable for analysis.

Using this combination approach resulted in a three level outcome variable as follows:

- 3 = uses the SHS for more than 50% of buying AND selling (n=121; 40.3%)
- 2 = uses the SHS for more than 50% of buying OR selling (n=63; 21.0%)
- 1 = does not use the SHS for more than 50% of buying AND selling (n=116; 38.7%)

**Explanatory variables:** To investigate the uptake of the SHS most of the variables in the survey were included initially in univariate analysis; the main exclusions being questions about producer attitudes to the SHS and the verbatim questions. Of the total of 24 explanatory variables tested, two were quantitative (years of experience and the number of sheep clients the agent deals with) and 22 were categorical.

Of these 24 variables, 11 had *P*-values <0.25, the predetermined cut-off level for inclusion of variables into multivariable model. There was no variables with ≥ 10% missing observations, and none of the pairs of variables had Spearman rank correlation coefficient of >0.7. One pair – years of experience and age – were highly correlated but both had *P*-values greater than 0.25 and were thus excluded due to this reason. Table 4.16 summarises the final model.

Variables	Categories	b	SE(b)	OR	95% CI		P-value
INTERCEPTS	0	-1.51	0.40	.	.	.	
	1	-0.11	0.39	.	.	.	
	2	0.51	0.40	.	.	.	
Work conducted in locations where SHS is not required (Q28)							<0.001
	<=75%	0.00		1.00			
	>75%	-1.38	0.25	0.25	0.15	0.41	
State (Q3)							<0.001
	NSW	0.00		1.00			
	VIC	-0.65	0.28	0.52	0.30	0.92	
	QLD	-0.62	0.35	0.54	0.28	1.06	
	SA	1.41	0.47	4.10	1.71	10.81	
	WA	-1.74	0.47	0.18	0.07	0.43	
	TAS	-2.52	0.65	0.08	0.02	0.29	
SHS is useful (Q43_2)							0.032
	N+D+SD	0.00		1.00			
	SA+A	0.81	0.39	2.25	1.07	4.84	
Only ask for SHS when client requests it (Q46)							0.008
	Yes	0.00		1.00			
	No	0.62	0.23	1.86	1.18	2.95	

SHS is effective for managing disease risks (Q43_1)						0.026
	N+D+SD	0.00		1.00		
	SA+A	0.65	0.29	1.91	1.08	3.39

Table 4.16. Final multivariate logistic regression model for factors associated with uptake of the SHS by agents.

Results of logistic regression indicated that five variables were significantly associated with levels of the uptake of the SHS; the amount of work undertaken in locations where the SHS was not required/mandatory, the State in which the agent was based, whether agents believed that the SHS was useful and effective for managing disease risks, and whether agents only asked for the SHS when their clients requested it.

Figure 4.17 graphically presents the results of the logistic regression model.

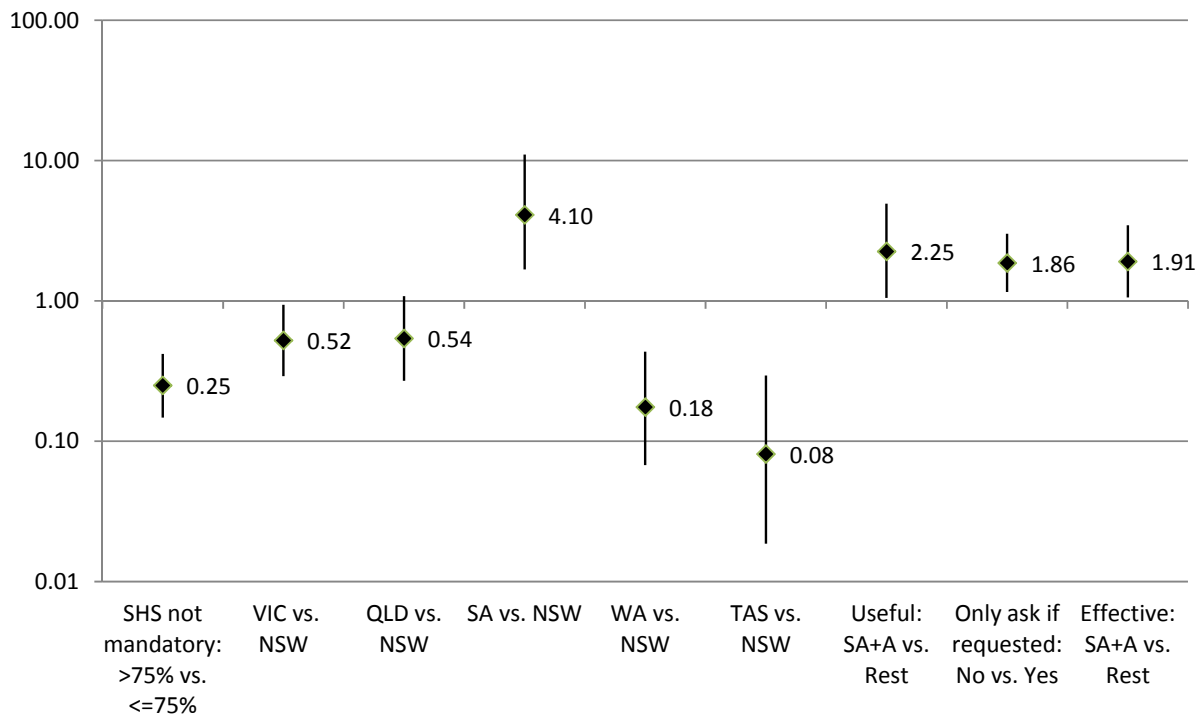


Figure 4.17. Results of the multivariate logistic regression model, with odds ratios shown. (Markers above the reference line (with OR>1.0) indicate that the variable is significantly associated with greater uptake of the SHS and those below (with OR<1.0) indicate that the variable is significantly associated with lower uptake of the SHS.)

Final multivariate model data presented in Figure 4.17 clearly show the direction and effect sizes of associations with the explanatory variables. These findings are summarised below:

- Agents who conduct more than 75% of their sheep work in locations where the SHS is not required/mandatory are significantly less likely to use the SHS.
- Agents working in SA are significantly more likely to use the SHS than those in NSW (reference)
- Agents working in VIC, WA, and TAS are significantly less likely to use the SHS than those in NSW (reference)

- Agents who believe that the SHS is useful are significantly more likely to use it than those who don't.
- Agents who believe that the SHS is effective for managing disease risks are significantly more likely to use it than those who don't.
- Agents who don't only ask for the SHS when the client requests it are significantly more likely to use the SHS, i.e. those who routinely request it

As the final model is tested in presence of all the significant variables, this identifies the key factors that are linked with uptake of the SHS and, by their omission, those that are not linked to uptake. Factors related to the agent directly, such as experience, age, or role do not appear to be important here, and similarly, characteristics of the client base (enterprise type, size), and the agent's perceived standing and influence within it do not appear to relate to uptake of the SHS. Other operating factors, such as the amount of buying and selling for slaughter and the sales environment (e.g. saleyards, private sales) also do not appear to be associated with level of uptake.

In conclusion, operating 'climate', i.e. largely external factors such as the jurisdictionally-based setting and the extent of operating in locations in which the SHS is not believed to be required or mandated, is a major factor in uptake of the SHS. Also, it would seem that agents who have embraced use of the SHS as a routine part of their practice are also more likely to be using the SHS and are not influenced by the interest/lack of interest of their clients. Finally, positive attitudes towards the SHS; specifically its usefulness and effectiveness as a tool for managing disease risks are also associated with uptake.

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## 5. RESEARCH SUMMARY

This report contains an extensive analysis of producer and agent survey data. This section will summarise the main findings, and will also critically review the research project more broadly.

### Review of survey results

#### *Producer survey results*

Review and discussion sections were presented throughout the producer survey results section, and readers are guided to these for more detailed findings.

#### *Sample*

Data were successfully collected from the national sheep producer population in line with the agreed sampling frame, ensuring that these data may be considered nationally representative of sheep producers (as defined by the target description). In terms of the sample demographics it is expected that these reflect the producer population. Producers in this sample; being those primarily responsible for animal health management decisions, were mostly males over 45 years of age, with a mean of 36 years in sheep production, and the majority were based in NSW and VIC. It is important to keep these sample characteristics in mind, as survey data presented in this report have been provided by a highly experienced, professional, and (presumably) successful group of producers.

#### *Enterprise*

Two thirds were in mixed wool and meat enterprises and more than 85% were commercial. Over half the sample reported that they operate partially closed flocks, introducing only rams, and a further 13% indicated that they run totally closed flocks. The finding that almost two thirds of the sample rarely introduces sheep into their flocks suggests that the opportunity for disease through introduction of sheep onto properties is fairly limited and is mostly confined to rams for these particular producers. Presumably these producers will also believe this to be the case, and this is likely to affect their attitudes to disease management and reduce their sense of personal vulnerability to introduced disease threats in their flocks. Also, as data cross-tabulations by State indicate, there are likely to be geographical differences in the distributions of types of enterprise, their sizes, and operation, and disease threats; these characteristics are an inherent underlying component in the data and are likely to influence attitudes and practices of producers in various States differently.

#### *Purchasing sheep*

The median number of times sheep were purchased and introduced onto property over the last two years was two times, with a mean of four. No sheep were introduced onto property by a quarter of the sample in this time frame. More purchases were made off-farm than through saleyards with more than a quarter of the sample buying off-farm twice or more in this period. Two thirds of the sample reported that they tended to buy from only one vendor, or a small group of vendors, with assurance of good quality and trust and knowledge of the vendor being reported most frequently as the main reasons for this approach. The reason of reduced disease risk did not appear to be a salient motivator in this decision, although it was

mentioned by some. However, when asked how they ensured that the sheep they bought didn't have disease, the largest group of comments referred to buying from trusted producers. The other commonly reported approaches were by direct inspection, use of the SHS and using agents to check on their behalf. It would appear that most producers are limiting their disease risk through their purchasing practices and reliance on a smaller number of trusted vendors.

With regard to agents, just over half of the producers who had purchased sheep in the preceding two years had used an agent for all their purchases and around a quarter had not used agents at all. Producers in TAS, WA, SA and VIC were the most likely to be using the services of agents, and those in QLD were least likely.

### ***Selling sheep***

Producers were asked about the number of times they had sold sheep *other than for slaughter* in the preceding two years, there was a strong positive skew in the distribution of responses with the median number of sales being much lower than the mean. A third of the sample did not sell at all and the median number of sales was two in this time frame. However the mean number of sales was almost 10, with around 5% of producers selling more than 30 times. When asked how they assured the health of their sheep to others the most frequently given responses were by providing the SHS, using NVDs, and telling their agent. A much larger proportion of producers (75%) used agents for selling sheep.

### ***Use of the SHS***

Around a third of producers were very familiar with the SHS and its content, however 22% had never heard of it, and a further 17% were not aware of any of its content, i.e. around 40% were essentially ignorant of it. Producers in QLD and WA were more likely not to be aware of the SHS (59% and 65%, respectively) compared to those in other States. Clearly, if there is a desire to have national implementation of the SHS as a biosecurity tool there is a great deal of work required to raise awareness.

In terms of its use, when those who had indicated that they made sales and purchases in the preceding two years were asked about the frequency with which they supplied or requested the SHS there tended to be a largely 'all or nothing' response, with, very roughly, half using the SHS all the time and half not using it at all. There were clear differences in uptake of the SHS between producers in different States, with those in SA and NSW being more likely to use the SHS. There was also a tendency for more producers to use it *all the time* when selling. The proportion of producers using the SHS for ALL purchasing and selling, respectively, was SA 59/75%; NSW 59/61%; VIC 40/47%; TAS 31/39%; QLD 21/32%; and WA 19/42%.

It is interesting to speculate on the proportionately greater use of the SHS for selling than buying. Is it because of something inherent in the selling process itself and possibly the more widespread use of agents, or is it because producers are more inclined to regard the SHS as a tool to make more money (as in the sales context) rather than it being a tool to assure disease-free status (as in the purchasing context)? This underlying perception may have implications for the best choice of messaging to use to enhance uptake.



Although the uptake and implementation of the SHS is varied across states, with some having low uptake it is also interesting to consider why, in NSW and SA where the SHS is mandated, there are between a third and a quarter of producers (36/25% in NSW and 38/23% in SA) reporting that they NEVER use the SHS when purchasing and selling sheep. This figure is also an underestimate, since a further 14% and 5% in NSW and SA, respectively, report that they have never heard of the SHS.

When it came to completing the SHS, like its use, it tended to be all or nothing, with little evidence of partial completion. Initial data indicated that producers rated the consignment, footrot, and lice information sections the most useful information on the SHS. However, additional interpretation of the categorised data suggested that the OJD information was probably regarded as equally, if not slightly more useful by producers.

When producers were presented with a range of statements about the SHS, their attitudes tended to be positive, with it being regarded as effective for disease management, as it being seen to provide benefits and not as a hindrance to free trade. The refusal of a vendor to complete an SHS was regarded as something that would prevent a producer purchasing from that vendor. There was a mix of opinion about the financial benefits of using the SHS and of willingness to trust the information provided by others on the SHS. Many of the more positive attitudes tended to follow patterns of its use within States, with producers in SA, NSW and those in low prevalence areas, who generally reported greater uptake, tending to view the SHS more positively, and feeling that there were more benefits to its use. Those in WA and QLD generally held less positive views; although the views of these producers were still quite favourable overall.

The potential role of agents in the use of the SHS was further highlighted in this section with most producers indicating they would be willing to supply/request the SHS if their agent told them to, and expecting that their agent would obtain a SHS on their behalf.

When asked what would encourage uptake of the SHS a mix of increased enforcement, better education/awareness and simplification were suggested most frequently. Responses to this question have been provided in full in the accompanying Data Appendix Report. These were some of the most expansive/informative comments data collected in the survey.

### ***General health of sheep***

Most producers had avoided purchasing sheep with diseases or conditions noted on the SHS and therefore the motivation of past (bad) experience in unlikely to be a major motivating factor driving use of the SHS. Those in NSW and VIC were more likely to have bought diseased sheep, with footrot and lice being the main, but probably also the more obvious, conditions reported. Producers in NSW were slightly less trusting than others to take someone's word for the health of their sheep; this is possibly related to prior experience with buying diseased sheep, leading to a generally more cautious approach. Producers generally appeared to be willing to get sheep tested if they suspected a disease listed on the SHS and an overwhelmingly large proportion agreed that controlling the spread of OJD was important.

### ***Disease threat appraisal***

Overall, producers appear to feel that disease threats are fairly serious to their enterprises but that they are relatively unlikely to occur or affect their sheep. This is likely to lower their general sensitivity to such threats, especially as a sense of vulnerability is likely to be the stronger driver of threat perception. In relation to coping with disease threats, producers generally seem to feel fairly confident that they can take effective action to prevent diseases (self-efficacy/control), and they are moderately confident in the effectiveness of the disease management and prevention options they have available to them. Research would suggest that, of these factors, a sense of self-efficacy or control is the one that is most likely to determine uptake of recommended protective behaviours; in this biosecurity context, uptake of the SHS and operation of good disease management practices.

Survey data suggests that producers perceive the general threat of sheep disease differently in different States. Those in VIC and TAS, and those in high OJD prevalence areas, are likely to have higher levels of internal conflict in relation to disease threat; having a greater sense of threat severity and higher perceived vulnerability, but at the same time feeling less able to take effective action and having less confidence in the effectiveness of the actions that could be taken. Of all producers, these groups may be more amenable to, and receptive of, support and intervention. By comparison, producers in SA, and NSW to a slightly lesser extent, appear to be better placed; with a moderately high perception of threat severity, but with a more robust perception of their ability to cope and manage these threats.

### ***Current on-farm management practices***

In general, on-farm management practices appear to be high with good inspection and disease monitoring and movement recording being undertaken. There is, though, a degree of variability both within and between practices. Some of the hygiene/cleanliness practices are less widely employed and introduced sheep quarantining and frequent regular monitoring is slightly less widely practiced than some of the other practices investigated.

Producer commitment to stringent health management and the importance of disease-free status to consumer trust is recognised by most. Interestingly, though, judgements about others are less favourable, with around half thinking that their animal health management is better than most producers, and more than half of producers agree that some producers prefer not to know their disease status, suggesting an underlying level of general suspicion or mistrust of others.

### ***OJD/SHS status in area***

Around 40% of producers reported that the SHS was mandatory in their State, with those in SA and NSW more likely to report this. Generally, knowledge of current OJD prevalence area was fairly poor, with around 40% of producers in VIC, QLD, WA and TAS reporting that they 'don't know' their current level, and self-reported prevalence being as low as 17% accurate in some areas. Levels of accuracy were higher in SA and NSW, however there were still up to a quarter of producers in these States reporting that they didn't know their prevalence area.

In the mixed prevalence States of NSW and VIC there was a tendency to underestimate OJD prevalence level; with 13% of producers in NSW self-reporting 'high' when 28% were

verified as high, and 12% of producers in VIC self-reporting 'high' when 64% were verified as 'high'. A combination of poor, or patchy, knowledge of OJD prevalence area and a tendency to underestimate disease risk are clearly likely to pose threats to animal health at some level, and to result in potentially risky practice; this is especially concerning given that producers in this sample are from larger and, presumably, more professional operations and are also those with primary responsibility for animal health management decisions.

In addition to relatively poor accuracy of knowledge regarding OJD prevalence area, the majority of producers across all States were confident in their self-reported response – above 70% in all States.

As OJD prevalence areas were changed in some areas on 01 January 2011 and the survey was conducted in early March it is possible that many producers were not aware of these changes yet. Over half of producers in WA and VIC reported that their prevalence areas did NOT change (55% and 60%, respectively) when they all changed, and 35% of producers in WA reported their OJD prevalence area as low. This general lack of awareness seems disappointing, given the experience of the producers and professional level at which they are operating, and possibly indicates a degree of indifference or ambivalence in this area.

In relation to the completion of the SHS, poor knowledge of current OJD prevalence area must cast a degree of doubt on the validity of information provided on the Category A section of the ABC points score calculation, and potentially undermine the OJD risk assessment.

#### ***Factors associated with the uptake of the SHS***

The final analysis of producer data was a logistic regression analysis to identify factors in the data associated with uptake of the SHS. Nine variables were significant in the final model. Increased uptake of the SHS was associated with being based in a State in which the SHS was regarded by the producer as mandatory and being a female producer. Those who had a higher uptake of the SHS also felt they were able to complete it accurately, and used the points system (ABC scores) to guide their purchases. Those who felt able to assess the health status of sheep by inspecting them visually at a sale were also more likely to use the SHS. This latter finding might seem somewhat unexpected; as one might expect that producers who are confident in their ability to detect health issues themselves would not feel a need to rely on the SHS. However, it is possible that these producers are also more knowledgeable and/or have experience of sheep disease and appreciate the additional level of assurance provided by the SHS.

Those who were less likely to use the SHS were also more likely to agree that they don't complete the SHS because they don't have to, again, highlighting differences in jurisdictional implementation of the SHS as a major factor in its uptake. Also, those who use the SHS less were also more likely to agree that their agent doesn't ask for the SHS when they purchase sheep. It is not clear whether this indicates that agents are particularly influential in producer uptake of the SHS or, simply, that those who are less likely to use the SHS are generally operating in environments where its use is not part of standard practice and therefore others are not using it either. Finally, frequency of purchasing onto property and selling other than to slaughter were found to influence uptake, where those who had not completed one or other type of transaction (but had completed some transactions in the last two years) were less likely to use the SHS.

## ***Agent survey results***

### ***Sample***

Interviews were successfully completed with 300 livestock agents currently working with sheep producers. The sample was drawn from the online membership list of the peak industry body, ALPA, which represents more than 97% of livestock and property agents. The survey response rate was 44%. Given that the random sample of 300 agents was a sizeable portion of the overall membership and that the response rate was good there can be confidence that this sample is representative of the national livestock agent population; at least those working in areas where sheep producers are based. In terms of the sample demographics, the agent sample was almost entirely males, and three quarters were aged 35-65, and like sheep producers, the majority was based in NSW and VIC.

### ***Experience***

More than half of the sample comprised senior agents with, on average, 28 years of experience as an agent and 23 years of experience in their current district. For more than three quarters of the sample the principal enterprise type of the bulk of their client base was meat-commercial. As reflected in the producer data, agents attributed much more of their work to selling (73%) than buying (27%). Less than 3% of the agent sample was focused more towards buying.

### ***Operating environment***

Just over half of agents worked mostly in saleyards, with around a quarter working mostly in private sales. It is interesting to note that the balance of sales locations for producers lay in the other direction with more off-farm sales than saleyard sales. A greater proportion of sales were direct to slaughter (around 40% of agents identified that more than half their sales were direct to slaughter), compared to around 12% identifying that more than half their purchases were direct to slaughter.

### ***Use of the SHS***

As reflected in the producer data, use of the SHS was typically 'all or nothing' with 42% and 49% of agents using the SHS for all purchasing and selling, respectively, and a similar proportion not using it at all for purchasing and selling.

### ***Client base and standing within it***

A large proportion of the agents felt that they had an established working relationship with the majority of their clients. More than half felt that their clients relied on them for advice about the health of sheep they were planning to buy a great deal; with a similar proportion believing that the majority of their clients relied solely on their judgement to purchase disease-free sheep. When asked about the frequency of different types of advice they might offer producers, it appeared that agents were frequently providing advice on paperwork, such as completion of the NVD and the SHS, but were less likely to be providing advice on sheep management or OJD vaccination. Overall around half of producers felt that they had a lot of influence on producers and a further third of agents felt they had a great deal of influence. Data from this section of the survey clearly suggests a strong and trusted

relationship between agents and producers, and this is similarly reflected in the producer data, suggesting that this is also recognised by producers.

### ***Perceived disease threats***

Agents were highly confident in their knowledge of local disease threats and for the sample overall the threat of lice was greater than the other threats investigated. Given the high level of local experience of the agents in the sample it is highly likely that such judgements are correct. Also, it is expected that there will be regional variation in disease threats and this can be investigated further to see if there are associations between the agents' 'hot spots' for certain diseases and differences in both agent and producer disease management behaviour and SHS use in those areas.

### ***Sheep health and use of the SHS***

Around half of the agent sample conducts more than half of their sheep work in locations where the SHS is not required. Interestingly, although agents indicate that around 70% of producers complete all the SHS, they also suggest that higher proportions complete the SHS partially compared to the equivalent information provided by producers directly. When asked about producers' knowledge and ability to complete the SHS it generally looks as though agents are more confident about producers than producers are about themselves, although it is difficult to make direct comparisons. Agents' perceptions of producers' views on the SHS appear similar to those expressed by producers themselves; with agents indicating that they think producers feel that the SHS is an effective tool for assuring buyers and seller about the health of sheep.

When asked about potential barriers and drivers to uptake of the SHS, drivers included the mandatory nature of the SHS ('because they have to'), getting a better price, and more buyer interest when selling, and protection from buying diseased sheep, provision of useful information and comeback/assurance were identified as drivers for requesting a SHS when buying. Common barriers to completion were identified for both buying and selling; these were the lack of mandatory completion ('don't have to'), apathy ('can't be bothered') ignorance/lack of awareness or knowledge of the SHS, and lack of apparent benefits. These findings correspond with comments made by producers and provide clear options to jurisdictions if they want to improve uptake.

With regard to their own views on the SHS agents appear to be positive about it as an effective, necessary and useful tool and around a half of agents report that they always encourage producers to supply or request a SHS. When asked about how agents could influence producers to use the SHS suggestions were mostly around greater promotion, endorsement, and education of producers, as was demanding its use more. This suggests that agents appreciate the potential role they can play in increasing the uptake of the SHS, although it should also be noted that some suggest that this shouldn't be their responsibility.

### ***Factors associated with the uptake of the SHS***

Finally, logistic regression analysis identified the five main factors associated with agent uptake of the SHS. These included:

- the jurisdiction/State in which the agent was based and, presumably, the influence of the general operating 'norm' in that jurisdiction,
- conducting large proportions of work (>75%) in locations where the SHS was not required or mandated,
- routine use of the SHS, regardless of whether clients requested it, and
- positive attitudinal factors, specifically feeling that the SHS is useful and also that it is effective for managing disease risks.

## **Project review**

### ***Meeting objectives***

The project had four main objectives, and these will be reviewed along with a brief assessment of how they have been achieved.

The first objective was to determine the uptake and use of the SHS and the second was to identify any regional variation in responses and reasons for the variation to the responses. Through the producer survey it has been possible to explore the uptake of the SHS across States, different OJD prevalence areas, different operating environments, and both buying and selling transactions, similarly most factors have been explored with livestock agents. More detailed statistical analysis has made it possible to identify the main factors associated with uptake of the SHS by both producers and agents.

The third project objective was to identify possible drivers and barriers to the SHS uptake, particularly those that may be amenable to change or influence. This was achieved by two means. The statistical analysis of factors associated with uptake of the SHS by agents and producers identified the main factors in the data that link to reported uptake, and hence provide a shortlist of key areas that could/should be addressed and are possibly the most likely to effect change in uptake. The second, and more direct approach, involved the use of targeted questions asking producers about situations in which they use/don't use the SHS, asking agents about their perceptions of barriers and drivers of use of the SHS, and asking both of these nationally-representative groups what could be done to increase uptake.

The final objective was to collect data that would be considered representative of the sheep producer and livestock agent populations and to assemble a dataset of sufficient size to perform robust and reliable statistical analyses. This has been achieved through use of an established and professional market research company with extensive access to the producer population and use of a robust sampling approach. The agent sample was based on a sizeable random sample of the main membership of the peak national industry body representing livestock agents. Both surveys successfully achieved their target quotas with acceptable response rates of 33% for producers and 44% for agents. The resulting datasets have been used for descriptive and statistical analysis, and are sufficiently large to enable reliable and powerful statistical analysis to be conducted.

In addition to these main objectives, the research has explored the nature of the agent-producer relationship and the influence of agents on producers and the broader biosecurity and sheep health management practices of producers.

### ***Strengths and limitations***

As with any research, this project has both strengths and limitations and it is important that these should be considered when reviewing the data and its implications. In terms of strengths, the survey approach included use of demonstrably large and representative samples of the two target populations taken from established and comprehensive databases. Also, the CATI methodology and the use of experienced interviewers is an additional strength, resulting in good response rates, standardised procedures for data collection and coding, and high levels of successful interview completion/low drop-out.

Additional methodological strengths stem from the design of the questionnaire, including the structuring of questions and the wide range and scope of the questionnaire content. The questionnaire not only addressed the direct issues of SHS uptake and current animal health management practices, it also addressed supporting issues around attitudes, knowledge, social and environmental factors, and differences in enterprise operation. In addition, many of the questions required time-bounded data, ensuring that responses provided were for *recent* experience and *current* practice, and reducing limitations associated with recall bias.

Although not fully discussed in the report, the research and questionnaire content was based around established psychological and public health theory regarding threat perception and coping, and was consistent with national guidelines regarding assessment of recommended on-farm biosecurity practices.

In relation to research weaknesses, all survey research has potential limitations regarding issues such as response rates, selection bias, and sampling limitations. As mentioned above, actions were taken to minimise many of these, but it remains that not all producers or agents are likely to have an equal probability of selection. Also, there are issues of non-response bias, as with any survey research. As producers and agents were able to choose to opt-out of taking part in the survey it is not possible to know whether there is any systematic bias in the data through non-responding by producers/agents with common characteristics, e.g. those with limited resources, younger producers.

A further methodological limitation relates to the questionnaire content being concerned with uptake of the SHS and biosecurity practices. Clearly there are likely to be some issues of social desirability that are hard to avoid with such research, and these limitations are present in many research methods that rely on collection of subjective data. Producers in areas where the SHS is mandatory are likely to feel greater pressure to provide acceptable or socially desirable answers regarding their uptake of the SHS and adherence to good operational practices. Some of these limitations are overcome by the use of neutral parties being identified as responsible for the research and conducting the interviews, i.e. university researchers and market research interviewers, and additional factors such as participant anonymity and balanced content that acknowledges 'real world' views and approaches, also help to reduce these limitations.

Finally, and with regard to the research more broadly, a limitation of the current research is that the producer data excludes input from producers in smaller enterprises and therefore the views and practices of this sector of the sheep industry are not represented here. Prior research conducted by the research team on biosecurity practices of horse owners during the equine influenza outbreak in 2007 and the biosecurity practices of pork producers during the human 'swine flu' influenza pandemic in 2009 suggests that those in smaller enterprises

and those who do not depend on livestock for income tend to have lower levels of biosecurity compared to larger, commercial enterprises. As such, data in this report probably represent the national sheep industry's best case with their 'best' people. As mentioned earlier in the report, the producers in the sample are highly experienced and have been in the industry for a long time (presumably they have been successful too, as they are still working in the industry after all these years). Their responses are likely to be different in many ways to those producers who run smaller enterprises and hobby farms, and who are likely to have much more varied levels of expertise; both in running sheep enterprises and also in prior experience and knowledge of sheep diseases.

## **Implications of findings and recommendations**

It is anticipated that the implications of the findings will be more fully recognised and the recommendations will be developed most successfully through dissemination of the research report and its contents and wider discussion with government agencies and industry bodies. However, based on the data provided by the producers and agents in this study the following observations are made and offered as a starting point for discussion.

### ***Issues of implementation and regulation***

Unsurprisingly, one of the main factors associated with uptake of the SHS and with attitudes towards it is its implementation across States. As a 'national' initiative its current implementation is inconsistent; with its use mandated in certain States, implemented with exceptions in some areas, and advocated but not mandated in others. If the goal is to have a national uptake of the SHS it is clear that its implementation needs to be harmonised. Producers who are positive about the SHS, and those who were asked what could be done to increase its uptake, call for its use to be mandated, for it to be regulated, and for greater inter-State co-operation. Currently sheep producers are receiving mixed messages. Such an approach is unlikely to result in widespread or spontaneous buy-in from producers that will result in greater uptake.

The sheep industry is complex and issues addressed in this study are multifactorial, with different types of enterprises, different scales of operation in different geographical areas, and with differing levels of disease threats. It is clearly challenging to have a 'one size fits all' solution with regard to sheep health assurance and disease risk management.

Producers and agents have indicated that, in a climate where the SHS is not used, no one expects it. If uptake is to be increased, then use of the SHS needs to become part of standard practice, 'the norm', what is expected.

Currently attitudes regarding the SHS mirror its uptake. Those that use it have positive attitudes towards it. This is identified clearly in statistical modelling of agent uptake of the SHS, in which those that use the SHS also agree that it is effective for managing disease risks and it is useful. This is an encouraging finding, suggesting there is positive reinforcement associated with its uptake.

Data indicate that there are probably three clustered pairs of States when it comes to uptake of the SHS and favourable attitudes: SA and NSW; VIC and TAS; and QLD and WA. Producers in SA and NSW seem to have accepted the SHS, although descriptive data suggests that SA producers are in greater accord. NSW producers have a mostly positive



attitude to the SHS, but there is also evidence, at times, of a small but negative swell of opinion. Analysis of threat and coping appraisal also suggested that producers in SA have achieved a 'healthy' balance between a realistic threat appraisal of sheep diseases and a positive sense of control and self-efficacy to manage them. It would be useful to evaluate the implementation of the SHS and the approach taken to producers in SA in relation to animal health management and disease risk assessment to identify aspects of 'best practice' that might be effective elsewhere.

With regard to producers in VIC and TAS, these groups generally appeared to have a heightened sheep disease threat appraisal, but felt less able to take effective action in response. From the perspective of psychological response to threat, producers in these States would appear to be the priority group for support and intervention and could be a good focus for Phase Two research.

### ***Issues of awareness and knowledge***

Like issues of implementation it is impossible to ignore the relatively poor levels of awareness and knowledge of the SHS across the sheep industry and the inaccuracy of self-reported OJD prevalence area. It is estimated that around 40% of the industry is functionally ignorant of the SHS (22% have never heard of it and 17% have heard of it but are not familiar with any of its content). Lack of awareness and ignorance are identified by agents as one of the main barriers to uptake of the SHS, and producers suggest that improved education and awareness and simplification of its use (along with stricter enforcement) are things that would encourage better use of the SHS. This is clearly a fundamental issue that needs to be addressed if national uptake is to be increased.

Lack of knowledge and awareness in the industry extends to a lack of accurate and current knowledge of OJD prevalence area. Over a third of producers nationally said that they did not know their OJD prevalence area. Accuracy of self-reported prevalence area ranged from 17% to 63%. In addition, and despite this poor performance, typically around 70% of producers felt confident that their response was correct. Of more concern, those in medium and high prevalence areas tended to underestimate their prevalence area.

As OJD is a significant disease threat, and one that has resulted in hardship for producers historically, it seems somewhat surprising that this basic knowledge is so poor, and there appears to be such a level of ambivalence. Even if OJD is not regarded as the main disease threat, per se, it is interesting to wonder if data like these are a general indicator of poor disease knowledge and awareness more broadly in the industry, and therefore suggest a more systemic problem. In addition, it needs to be born in mind that these data are provided by a sample of producers who are highly experienced, are the primary person responsible for animal health decisions, and represent the 'higher end' of the industry. Does this suggest that awareness may be poorer or more variable still with the smaller producers?

Finally, the tendency to underestimate OJD prevalence area is a general concern with implications for how this translates into potentially risky behaviours and completion of the ABC score on the SHS.

### ***Patterns of use of the SHS***

Data indicated that use of the SHS in both producers and agents tends to be 'all or none'. Although some of this finding could be explained by the mandatory/discretionary nature of the implementation of the SHS across the sample, it also suggests and strengthens an earlier point that bringing the SHS into standard practice by more producers and agents will drive uptake. Once this is adopted as 'the norm' it will be expected, and once it is expected it will be requested. Also, as there are fewer agents to target than producers it may be more efficient to focus on agent uptake in the short term to drive producer uptake exponentially.

### ***Perceived benefits***

The benefits of the SHS need to be sold to producers. Those who use the SHS more tend to identify greater benefits of its use. Producers in SA, who report the greatest uptake, are more likely to feel that they get a better price if they sell with a SHS. Different benefits are likely to motivate different producers in different industry sectors and different disease risk areas. The SHS has multiple and different values in the context of buying and selling. In buying it is a protection; a tool to reduce disease risk and to assure the buyer. In selling it also provides assurance to buyers, but it may attract better prices, generate buyer interest and show that the producer is confident about the health status of his/her sheep and has nothing to hide. Data suggest that the SHS is used proportionately more in selling than buying, suggesting that price, and/or other dynamics in the selling process (including greater involvement of agents) is possibly a greater driver. These different motivating factors could be explored further to help craft more tailored messages to different parts of the industry.

### ***The role of agents***

Investigation of agents' perceived influence on producers and similar investigation of producers' views of agents has shown that agents are highly trusted by producers who use their services. They are relied on by producers to protect them from buying diseased sheep, and agents feel that they have a high degree of influence on producers. Analysis of producer uptake of the SHS indicated that having an agent who does not request the SHS is a significant factor in low producer uptake of the SHS. Although some agents expressed concern that it is not their responsibility to influence producers' use of the SHS directly, they do have a significant part to play in the industry both commercially and in disease risk management and biosecurity. Therefore encouraging agent uptake of the SHS would appear to be a potential win-win strategy to improving animal health management generally and also influencing producer uptake.

## **Phase Two research**

The last section identified some fundamental issues that should be addressed to improve producer uptake of the SHS and some ideas for further investigation. Phase Two research could take any one of these issues directly linked to the survey data or investigate other influences that may impact on producer uptake of the SHS and improved animal health management. Issues such as the role of veterinarians in animal health management, and the attitudes of producers to OJD vaccination as a means to control OJD spread are also possible areas that could be explored.

As Phase One research was focussed on experienced and larger producers, it is recommended that Phase Two investigates the attitudes and practices of smaller sheep producers. Alternatively, or in addition, a follow-on study with producers in VIC and TAS is recommended as producers in these States appear to be faced with greater levels of disease risk, but appear to be least confident in their ability to take effective action to reduce such threats. They also have lower uptake of the SHS.

Finally, since data collection for this project was completed the research team has become aware of initiatives now underway in TAS to promote awareness and uptake of the SHS with producers and to encourage agents to take a more proactive role in promoting its use. As baseline data have been collected in this survey for TAS producers and agents it would be interesting to assess the effectiveness of these interventions and the ways in which they may have influenced producer health management practices, attitudes, and reported uptake of the SHS. Such a study could assess the suitability of specific initiatives for translation to other jurisdictions.

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