



## Breed Surveys – The basics of survey design, execution and analysis

Dan O'Neill

*MVB BSc(hons) GPCert(SAP) GPCert(FelP) GPCert(Derm) GPCert(B&PS) MSc(VetEpi) MRCVS*

### INTRODUCTION

There is currently limited validated information on disease frequencies of pedigree dogs. Pedigree animal owners are one important source of information on health matters relating to their own breeds and animals. **Accurate collection** of this information would add to the overall disease and breed specific information base. Such information is critical for well-informed and effective decision-making to manage common and important animal health problems.

Surveys (questionnaires) are one useful method of eliciting specific animal-health information from owners/breeders. The development of reliable and valid questionnaires is critical for the effective collection accurate information. Carrying out an ill-conceived and poorly executed survey will result in meaningless results and waste of valuable resource and, worse still, may led to incorrect interpretation and action.

The main purpose of this paper is to discuss questionnaires in relation to breed-specific health surveys but some other aspects of good survey design will also be covered. The under-lying concepts can equally be applied to many other forms of animal health inquiry. The complete topic of health survey design and analysis is the subject of year-long Masters Courses, so it will only be possible to highlight critical areas for consideration and common pitfalls to avoid. Further information can be found in the reading list provided in the references and further reading sections at the end.

#### **Why do a questionnaire survey?**

There are many gaps in important areas of current knowledge. In some cases, the knowledge does not currently exist and must be generated *de novo* by laboratory research (e.g. developing genetic tests) or clinical trials (e.g. comparing the effects of two drugs). In other cases, the knowledge does already exist but lies scattered in many different heads and computers and so is effectively wasted. A questionnaire survey is a method of collecting all these individual bits of information (the questionnaire) and joining them together (the statistical analysis) to reveal a (hopefully) accurate and useful picture (the interpretation) of reality.

There are many types of survey (postal, direct interviews, telephone, online) but they all hinge on asking selected respondents a standardised set of questions. The development of a valid and effective questionnaire thus underpins all surveys.

*Remember, the truth is out there; it is the job of the survey designer to reveal it.*

#### **Before we start: Some terms explained**

There are some important terms that should be understood before beginning to design a survey questionnaire.

A **questionnaire** is a tool designed to elicit and record recalled exposures from respondents.

A **variable**: is an attribute of a dog that *varies*. These are often the very thing that we are trying to find out in our survey. E.g. age and sex are variables; we may ask how old the dog is and whether the dog is male or female.

A **statistic**: is a measurement made on a sample that can then be extrapolated (generalised) to a whole population. E.g. 255 of 555 (46 per cent) dogs were given a positive diagnosis of syringomyelia; from that, we may extrapolate that 46% of all CKCS have syringomyelia (Parker 2011). Good statistical analysis will usually also show a 95% confidence interval (95% CI) around the sample result which is a range within which we are 95% confident that the true population result resides. (NB Don't forget about possible bias!!!)

**Prevalence**: is the proportion/percentage of **current** cases in a population at a given time. This includes cases that already existed prior to the measurement period as well as new cases that develop during the measurement period. Just like with fractions, the number of cases is called the *numerator* and the total number of animals is called the *denominator*. E.g. 255 of 555 (46 per cent) dogs were given a positive diagnosis of syringomyelia (Parker 2011). The numerator is 255 and the denominator is 555. The prevalence is either 0.46 or 46%.

**Incidence**: refers to **new** cases which develop within or over a specific time period. E.g. the incidence of non-healing by 9 months after bone fracture surgery in cats was 0.85%, with only 2 out of 233 fractures ending in non-union (McCartney and MacDonald 2006).

**Bias**: is calculation of a statistic in such a way that it is systematically different to the true intended population. *I.e. the truth is twisted*. E.g. I want to estimate the prevalence of lungworm in dogs in the UK so I test 100 dogs in the Kent/Surrey area. Since this area may have a higher level of lungworm than northern England, the interpretation would be biased (over-estimate) when I generalise to the whole of the UK (geographical bias). **Types of Bias**:

**Selection bias**: where some individuals or groups are more likely to take part in a research project than others and thus their characteristics will *bias* the results. E.g. selection of respondents at a dog show and assuming typical for breed owners as a whole.

**Measurement bias**: systematic inaccuracy in measurement. E.g. Asking German shepherd dog owners if their dogs have hip dysplasia. Dogs with spinal problems may be included and that will overestimate the true level of hip dysplasia.

**A confounder**: is another variable that may affect the results of the question (variable) that we specifically interested in. E.g. we may ask owners if their dog ever developed testicular cancer to get the prevalence of testicular cancer in a breed. But if we don't also ask whether dogs are entire or castrated, the results will be meaningless. If some dogs were castrated at 6 months of age, they cannot develop testicular cancer after this age but are still contributing to the denominator.

**A sampling frame**: is a list of the potential respondents to a questionnaire with unique identifications.

**Question Types** can be Open-ended (the respondent can answer with long sentences e.g. 'what is your opinion on complementary therapy') or Closed-ended (there are just 2 or a limited numbers of answers possible e.g. 'is your dog neutered' or 'how many puppies were born alive').

**Epidemiology**: is the study of health-related information to describe disease levels and to identify risk factors for disease.

## GENERAL TYPES OF INFORMATION

There are six general categories of information that we may wish to elicit;

1. Knowledge – what respondents know
2. Attitude – what respondents want or think
3. Belief – what respondents believe to be true
4. Behaviour – What respondents (or their animals) do, have done or will do
5. Experience – What has actually happened to the respondent (or their animals)
6. Attributes – Direct facts about the respondents (or their animals)

Most epidemiological studies relate to categories 4-6 (behaviour, experience and attributes). These are also easier to elicit quantitative answers (i.e. numerical) than the more general categories relating to belief or attitude.

## **SURVEY DESIGN**

Just as a house is only as strong as its foundations, so a survey is only as good as its design. Time spent considering all aspects of design and implementation will be rewarded by a smoother process and more robust results and interpretation. Design considerations for your breed survey should include the following topics:

### **What are your specific targets?**

It is vital to set out in advance the objectives and information required from the survey. These should be as specific as possible and not overly ambitious. It is better to get reliable information on a small number of topics than poor quality results on a wide range of questions.

Search the literature and speak to experts to see if the information already exists. Research previous attempts to answer this or similar questions and learn from earlier successes and failures. Try to get copies of previous questionnaires and breakdowns of response rates. Contact previous investigators to learn from their successes and failures.

All questionnaires should meet 3 main objectives:

- 1) To obtain results of targeted exposure variables
- 2) To minimise error in the results
- 3) To be as easy as possible to complete, process and analyse.

### **Form a design team**

Put together a project group for the study. This should include people knowledgeable about the language and attitudes of breeders (i.e. potential respondents), canine health (e.g. vets), how to access to owner registers, survey design, statistics, funding and useful support/endorsing organisations (e.g. breed clubs, Kennel Club, vet colleges).

Arrange focus group meetings with combinations of these people for structured discussion of the various aspects of the project. *Failing to plan is planning to fail.*

It is especially important, and often overlooked, that you must decide how you will statistically analyse the output **before** the questionnaire is designed. Many breed surveys are concerned with evaluating the frequency and types of disorders affecting particular breeds. Issues of selection bias (e.g. by posting questionnaires to specifically chosen breeders rather than by random allocation), measurement bias (e.g. asking for owner's opinion on their dog's health but failing to ask if this diagnosis was made by a vet and how it was proven such as MRI for syringomyelia) and confounding (e.g. asking for information on cancer in dogs and forgetting to ask for the animal's age) may be impossible to rectify later.

Decide how the survey will be carried out. All surveys involve the use of some form of questionnaire but this may be administered in several different ways, each with their own advantages and disadvantages. The use of standardised questionnaire is essential to allow the same questions to be asked of each respondent and thus to facilitate statistical analysis of the answered.

### **Types of questionnaire surveys**

There are four main methods of presenting a questionnaire with each one having its own advantages and disadvantages. The remainder of this paper will deal with postal questionnaires, though the general principles apply to all methods.

- 1) **Face-to-face** interviews administer questionnaires by appointment at home or by casual approach (e.g. at dog shows). These allow probing further on initial answers and clarification of questions. These are good for very detailed interviews and eliciting unexpected information. However, they are slow to perform (e.g. may have to travel to many sites) and relatively expensive. Interviewers will require training and there may be poor standardisation to the way the questions are presented. Respondents may try to conform to social norms in their answers rather than being totally honest (social desirability bias). Casual approaches at shows suffer the problems of selection bias (people attending shows and willing to answer questionnaires may be different to average owners) as well as lack of denominator number (i.e. how many people were approached overall).

- 2) **Telephone interviews:** These are a quick source of information and cost less than face-to-face interviews. Reasons for refusal can be captured and a wide geographical spread can be obtained. Telephone surveys allow explanations of questions that respondents don't understand, encourages participation more than passive approaches such as postal and can collect more lengthy opinion-based replies as well as individual extra questions depending on the direction of the interview. The move away from landlines towards mobile phone usage does increase selection bias and complex concepts can be difficult to get across by phone. Many people get irritated by phone surveys.
- 3) **Online surveys** are becoming more common as internet access and proficiency becomes more widespread. Questionnaires can be easily and cheaply administered (Survey Monkey 2011) and the general public are getting accustomed to using this format (Influenzanet 2011). Online surveys are low cost, produce the data in a usable computerised format and can reach large numbers of people. However, it may be difficult to know the true denominator for the survey or reasons why people choose not to participate. Computer literacy and access is required which can lead to selection bias. Not everyone is comfortable using computers, possibly leading to selection bias.
- 4) **Postal questionnaires:** These are a common method of capturing information. Administrative costs are less than for face-to-face and telephone. Respondents may be more honest in their responses and less likely to employ social desirability bias, especially if confidentiality has been assured. Respondents can complete the questionnaire at a time and place of their choosing and take as long as they like. No specific respondent skills apart from literacy are required. An accurate and up-to-date list of contact details will be required (sampling frame). It may be difficult to find reasons for non-response and it may take up to 3 months to get the majority of replies returned. The length of the questionnaire will be limited. However, low response rates can lead to response bias.

Some surveys are a one-off to answer a specific current question (e.g. type of housing among breeding dogs). It is also possible to design a survey that will be repeated regularly over time to evaluate changes in a topic of interest over time (e.g. attitudes of breeders towards microchipping of puppies before re-homing) (Influenzanet 2011).

### **Ethical and Data protection**

Since surveys involve collection of data that may be personal or sensitive, it is important to consider the need for ethical approval and data protection compliance in the collection, storage, sharing of data and publication of results.

## **QUESTIONNAIRES**

Questionnaires aim to elicit accurate and complete information from the respondent. Although questionnaire design may appear to be straightforward at the outset, the reality of applying a questionnaire is anything but simple and the task should not be taken on lightly. Questionnaire design encompasses several distinct and important steps.

1. Decide what information to seek
2. Develop a questionnaire
3. Pilot (i.e. trial, pre-test) the questionnaire
4. Refine (often also means dropping some questions) the questionnaire
5. Administer the questionnaire

### **1. Decide what information to seek**

Be specific in the targets set for the survey. Seeking to answer too many questions may result in poor answers to lots of questions but no good answers on any. Be wary asking about sensitive (e.g. dog aggression) or illegal (e.g. docking) issues. Asking such questions may result in cessation of answering or deliberately false answers. Questions with specific answers (e.g. age, sex) are easier to answer and analyse than questions where the answer has variability (e.g. amount of exercise given to dogs) or based on opinion (e.g. owner's belief about the cause of a disease).

### **2. Develop a questionnaire**

This can be a modification of a previously used version or developed from scratch. Modifying a previously used questionnaire offers the benefit of being faster to develop and also learning from the problems discovered when the original questionnaire was used. Contact the earlier investigators for

feedback on how they would improve their design and learn from their problems. However, there may not be a previous version available so sometimes a totally new one must be written.

### 3. Piloting the questionnaire

It is essential to pilot (pre-test) the questionnaire on a group of typical respondents in the format that it is planned to use the questionnaire (e.g. postal). After the questionnaire has been completed, the respondents should be asked detailed open question on their opinion of the questionnaire and what aspects that they felt could be improved. The pilot testing should answer:

- ✓ Was the questionnaire completed at all or was it terminated early
- ✓ Were some questions left unanswered
- ✓ How long did completion take
- ✓ Are all the words/terms understood
- ✓ Are all the questions interpreted equally
- ✓ Are the options to answer closed-ended questions exhaustive (i.e. all possible) and exclusive (i.e. non-overlapping) answers.
- ✓ Do all answers make sense

### 4. Refining the questionnaire

After the pilot, each question should be re-evaluated for wording, order and even whether to be included at all. The motto should be to only *collect what will be used and to use all that is collected*. Many questions may be dropped at this stage.

This may be followed by a further pilot of the refined questionnaire to assess the impact of the changes and decide on further amendments.

### 5. Administer the questionnaire

Once all the development work has been completed, the questionnaire can finally be administered.

## QUESTIONNAIRE DESIGN: IMPORTANT POINTS

### Early steps

Make a list of the specific pieces of information that is required from the study. Decide how these could be elucidated via specific questions. Plan how the answers to these questions could be statistically analysed to yield meaningful outcomes. Ensure that someone with statistical experience is involved in the development of the questionnaire.

### Length of the questionnaire

The level of demand placed on respondents to complete the questionnaire is called the *respondent burden*. There is an inverse relationship between the response rate/completion quality and the time taken/complexity of completion. Attempts to add extra questions or more complicated questions are likely to result in lower response rates and poorer quality response. While there is no ideal length of questionnaire, the length accepted by respondents will vary dependent upon how important they rate the topic to be. More than 4 pages should rarely be needed. Use the pilot test to evaluate the time length.

### Structure

A suggested structure for questionnaires includes the following sections:

- A. Introduction
- B. Instructions for completion and return
- C. Topic questions broken into logical sections
- D. Final information and thanks
- E. Extra space for additional answers or comments.

### A. Introduction

There are certain pieces of information that should be included in the introduction to improve the quality of the responses.

- The survey itself should begin with a covering letter or section that directly addresses the responder and explains the overall purpose of the study. This is the opportunity to 'sell' the concept and get 'buy-in' to completion by the responder.
- Research organisation: respondents are giving their time and effort and wish to feel that it is worthwhile. Endorsement by respected organisations enhances the value of their responses (eg Kennel Club, welfare organisations). Include the logos on the introductory letter.
- The name of the main researcher

- The overall research topic/purpose: it may be better to avoid being too specific about the research question to avoid leading towards certain responses or 'stopping' those that are not affected by this issue from replying because they feel that they would have nothing useful to offer.
- Confidentiality: It is important to stress that all responses will be treated with confidentiality and no persons will be identifiable in any publications. Also explain who will have access to the responses and whether the data will be shared with further research groups.
- The estimated time for completion: This should be included and should be accurate. Under-estimating the time is likely to result in early cessation of response once the estimated time limit is reached.
- The importance to animal welfare from completion should be emphasised and the respondent should be thanked sincerely for their assistance. It may be helpful also to explain how the recipients were selected.
- A further aid to participation is the provision of some reward. One option is a 'guilt' advance reward e.g. a free pen is included with the questionnaire or a commitment that a donation will be made to a named animal welfare charity for each returned form. A second option is an after-reward where all returned questionnaires will be entered into a draw for a valued prize. This offers the additional benefit that persons wishing to be entered into the draw are asked to provide their contact details, allowing further follow-up if required.
- Finally, recipients should be thanked again. In the case where they choose not to complete the questionnaire, they are asked to return the form in the prepaid envelope with a brief note explaining why they have opted not to participate. This will assist in interpreting the significance of the non-responders as well as in the design of future studies.
- A pre-paid addressed envelope should be included. The Royal Mail offers a service where a Freepost Number is allocated such that only those envelopes actually returned are charged (Royal Mail).

## **B. Instructions**

General instructions should describe how to answer questions by following specific instructions within the sections that are shown in *italics*. Answers to closed questions should be indicated by circling the answer code. Open questions should be answered within the boxes provided with overspill for additional answer space provided at the end of the questionnaire. Respondents should be advised to consider carefully their replies and try to answer as honestly as possible. Repeat again the importance to animal welfare and the confidentiality as well as the gratitude of the research team. The return address should be given here in case the prepaid envelope gets lost.

## **C. The Questions**

- A standard approach to layout will ease the respondent's navigation of the questionnaire. A good approach is to use:
  - CAPITAL LETTERS for the questions,
  - **Bold type** for the answer options and
  - *Italics* for the instructions on how to answer.
- Pre-code all questions to facilitate transferring answers from questionnaires to a computer. E.g. 'Is your dog vaccinated?' 1. No 2. Yes
- Follow the same order of answers and codes. E.g. It would be confusing to ask 'Is your dog vaccinated?' 1. No 2. Yes and then to have the next question 'Is your dog insured?' 0. Yes 1. No
- Instruct respondents to record their answers by circling the code number of their choice. Asking for a 'tick' may lead to confusion if a small mark or pen point has accidentally been made near an answer. Asking for an 'X' may confuse some since the 'X' is assumed by some to mean a negative answer.
- Do not have questions that are spread across two pages.
- Keep the questions short and precise.

### **Question order**

A neat and logical order to the questions eases respondent burden. It is important to gain some information on the respondents e.g. their gender, age, level of experience with dogs, etc but these are questions which are boring to owners and which they may also be reluctant to answer. It is best to leave these to the end of the questionnaire so that they don't lead to early cessation of response. Group the questions to follow logical topics (e.g. dog demographic, diet, state of health, exercise, etc). Within each topic group, start with the more general questions before focusing in on more specific or threatening questions.

### **Question and answer types**

Questions can be either open-ended or closed-ended. Open-ended questions provide no choice of suggested answers and are good for eliciting simple facts where there are many exclusive answers

e.g. what county do you live in? They are also useful for eliciting general opinion and belief e.g. what are your opinions on homeopathic medicines? Open questions are useful to get a general feel for the topic of interest and develop hypotheses that can be specifically tested later but are very difficult to analyse.

Closed-ended questions offer the respondent a choice from a range of possible answers e.g. How often does your dog cough each day? '0, 1-3, 4-6, 7-10, 11 or greater.' If all possible outcomes cannot be covered, than an option of 'Other' can be offered (the choice of answers must be 'exhaustive). If more than one outcome can apply (the answers are not mutually exclusive), it is important to specify this e.g. What do you feed your dog? Tick all that apply: 'Canned dogfood, Dry dogfood, Treats, Raw meat & bones diet, Homemade food, Leftovers, other. '

### Question wording

The words used should be those that would typically be used by the respondents. Avoid acronyms (e.g. MVD for mitral valve disease), technical jargon and complicated words. Aim for questions to be as specific and understandable as possible (e.g. 'How long do you normally walk your dog for?' could refer to length of time or distance and thus lead to confusing answers).

### For each question, aim to:

- ✓ Use simple words (maximum of 3 syllables) and avoid jargon. If technical terms or acronyms have to be used, explain these (e.g. HD; Hip Dysplasia)
- ✓ and short sentences

### Try to avoid:

- X Vague questions: Words such as 'normally', 'usually' and 'regularly' can be interpreted differently by different people. Try to be more precise. Instead of 'When do you normally de-worm your puppies?' try asking 'At what ages did you de-worm your most recent litter?'
- X Over-precision: Asking for extreme detail will increase the respondent burden and may lead to poor responses. (e.g. 'Since you first started breeding dogs, estimate the numbers of litters and puppies bred each year')
- X Biased or leading questions: These are questions with wording that lead a respondent towards one type of reply. E.g. 'Do you think that mutilations such as tail-docking should be banned?' versus 'Do you think that tail-docking should be permitted or not permitted?'
- X Sensitive questions: these are questions where the respondent may be uncomfortable about revealing the truth. Where the questions relates to something that is socially desirable (e.g. donating money to animal welfare research), respondents are more likely to over-report while socially undesirable behaviour (e.g. not poop-scooping in public parks) may be under-reported. To improve the quality of responses, such questions can be included towards the end of a section of less threatening questions. Alternatively, questions can be prefixed by a sentence to defuse the threat (e.g. 'Dogs may occasionally foul in public areas but it is not always possible to clear up (scoop) afterwards. They may be too far away or out of sight. You may have already used up all of your poop bags or shared them with another dog owner. In the past week, how often have you left a poop un-scooped?')
- X Double questions: Questions with more than one concept will be ambiguous. E.g. 'Do you use anti-bark or electric shock dog collars?' A positive response doesn't specify which from a wide range of products are used. It would be better to ask which of the following devices are used and give a list of options.
- X Double negatives: All questions should be phrased in a positive sense. The use of negatives in questions can be leading but also cause confusion as to how to reply. E.g. 'Should raw meat not form part of a dog's diet?' This question is both 'leading' towards a response that raw meat should be part of the canine diet but also is difficult to answer. A person who believes in raw meat diets instinctively wants to answer 'Yes' but needs to answer 'No'.
- X Mutually-exclusive answers: If more than one answer is possible, there must be the option to record either the most common or all of them. E.g. 'What de-wormer do you use? A. Panacur B. Drontal C. Stronghold D. Advocate e. Piperazine'. Some owners may use several de-wormers and thus not know how to answer. The questions could be rephrased as 'What de-wormer do you most commonly use?' or 'Rank these de-wormers in your order of usage'.
- X Assumptions about the respondent. Incorrect assumptions may lead to questions being left unanswered or offense being taken by the respondent. E.g. 'When feeding kibble dogfood, is it soaked before feeding?' Yes/No. The question assumes that kibble food is fed. It is better to first ask about the types of foods fed and then using a branching structure to ask about individual foods that are being fed.
- X Ambiguous time references. It is important to be as specific as possible when defining time. In the question 'How often do you bathe you dog', the respondent doesn't know the time frame for

the response since the frequency of bathing may change depending on the season. It would be better to ask 'In the past 4 weeks, how often have you bathed your dog'.

- X Cryptic questions. Always make it as obvious as possible what form the answer should take. Questions such as 'Passport? \_\_\_' are not explicit. Does this mean whether the dog or the owner has a passport? It would be better to ask; 'Does your dog hold a current Pets Passport?'

#### **D. Final information and thanks**

At the end, thank the respondent for their assistance and repeat how important their participation is for animal welfare. Explain that some basic information on the respondent will improve the interpretation of results and ask for information on respondent age, gender, number of years as a breeder, etc. Provide the researcher contact details in case further information is required. Ask for comments regarding the study to be added in the final blank section. Offer that study results can be sent if the respondent contact details are given.

#### **E. Blank space for additional answer space or comments**

Provide some blank space at the end of the questionnaire.

### **PRESENTATION**

A high quality of presentation is important to lend the study an air of authority as well as to facilitate completion. Good quality paper to withstand heavy pen pressure along with the use of colour and page numbering should accompany a neat layout of the sections. The font chosen should be clear and large enough that it can easily be read by even those with poor vision. Ideally, the questionnaire should be presented in booklet format with numbered pages. This allows printing on both sides of the sheets. Never use loose sheets of paper that can get separated or lost.

#### **Non-response**

Non-responders are generally different in many ways to responders. When the non-response rate is high, this can introduce biases that prevent the survey results from safely being generalised to the whole population. There are several steps that can increase the response rate. Thorough pilot testing should ensure that the length, presentation and information provided are acceptable. Endorsement by valued organisations and assurances of confidentiality and benefit to animal welfare are important. Questions should be understandable and not too taxing to answer. Offers of a direct reward (payment), prize-competition entry or donation to a relevant animal charity are a further enticement. Repeated approaches by e.g. follow-up letters ('prodding') to non-responders can be helpful and may at least record the reasons for non-response.

### **VALIDATION**

Validation determines the proportion of answers given that correspond with the 'true' situation. One method to detect obviously wrong answers is to build in some questions which record information on the same question but are worded in different ways. E.g. asking for dates of neutering in one section and dates of litters born in another would assess internal consistency. Repeated administration of questionnaires using different formats (e.g. face-to-face versus postal) or over time is another method. However, none of these methods check whether the answers are truly correct, just that they are consistent. Better methods of validation would be to independently check answers against reliable external information sources in a selection of cases (e.g. comparing owner responses against veterinary surgery records or owner-supplied pedigrees against Kennel Club pedigree records).

### **ANALYSIS**

The analysis of results from questionnaires is the subject of an entire body of science; statistics. Statistics refers to the analysis and summarising of large volumes of data from samples to produce useful summary descriptions that can be applied to the overall population. Simple statistics can be performed using Microsoft Excel to establish means and medians for responses. Excel will also produce helpful graphs to explain the data (e.g. bar charts, pie charts). However, these results are just describing the sample whereas we are often more interested in how the sample results can be generalised to predict the state of the total population. For this, more technical statistical analyses are required and this should require the input of someone familiar with the subject of statistics and analytical methods from the outset of the survey process.

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