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Bruno SAPY

**Relation between the domestic dogs'**

***well-being and life expectancy***

**statistical essay**

***Essay for the Prince Laurent Foundation Price***

Year 2003

We, the undersigned, herewith certify, that we kept informed of our candidacy for the :

“ PRICE OF THE PRINS LAURENT FOUNDATION 2003”

all the persons which have collaborated to this study or worked for its achievement.

Given and signed in Brussels on the 14<sup>th</sup> of August 2003.

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BRUNO SAPY

A handwritten signature in black ink, appearing to read 'Bruno SAPY', with a stylized flourish below it.

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- 5 2003 End of study training with Doctor Patrick Lecoindre, veterinarian gastro-enterologist  
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All the dogs who share our lives, .....for better and for worse

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## Introduction

Well-being and life expectancy: two indissociable concepts. Widely spread within the human species, this association, brought to the foreground on a daily basis, by the medical corps and the media, illustrates the necessity for one species to know the parameters, by which they are conditioned. The human society fluctuates along the knowledge gathered during its history. **Better know in order to better forecast. Better forecast in order to better live.** Forecast, or better prophylaxy, will permit the human species and the various other species, for which it is responsible, to increase the life expectancy of the incriminated species. The vaccinal prophylaxy is one example.

With it, we have eradicated certain endemic pathologies raging within various species.

**Biostatistic**, give us the possibility to work with basic data, and extract the meaning in terms of probability and **significability**. This way, we can make hypothetical forecast for future events, based on passed data. Just like the vaccination improves the immunity against known diseases, the statistical analysis gives us the possibility to extract with great accuracy, a risk factor associated with a given parameter.

The knowledge of the various elements influencing the life expectancy is a pre -requirement for the prophylaxy. This study, **the well- being of the animals**, will be a first step, a junction between the past and the future.

The Strasbourg convention (annex1) lists 5 principles, to describe the **"Well-being for the animals"** : the satisfaction of the nutritional and physiological needs, a non-aggressive environment, the absence of stress, and the possibility to express normal behaviour. The dogs share our privacy, in a broad sense. They share our lives, more or less intimately and this association could influence their life expectancy.

The pedigree, the sex, the size are intrinsic parameters for the animal and influence therefore the specific life expectancy, apart from the living environment. But, the housing, the family environment for the animal, the sterilization, and the type of nutrition, are extrinsic parameters for the animal, and can influence their personal and individual life expectancy. This is therefore influenced by the choices and the opportunities offered by the proprietors. These are therefore parameters, which could be modified, to bring them in line with the principles listed above.

It is the responsibility of the veterinarian, as a professional of the animals' health, but also as human being and citizen, to investigate the needs and requirements for the animals' well-being and to study the means to improve it. The positive meeting between two veterinarians, from two different generations, educated with different tools and methods, but following the same goal, i.e. the animals' health as a whole, was the starting point for this essay. The veterinarian, Dr. LIPPERT, who initiated this study in 1998, with the assistance of "Animals without Frontiers" came to visit me in 2002 in order to analyze the data gathered from statistics and computerized data, integrated in my students' degree course. The analysis and synthesis work could start.

Our objective is to study the influence of these various parameters on the life expectancy of the dog. The statistical use of more than 500 "DOGS' LIFE SHEETS or DOGS' FAMILY BOOK", collected during five years, from 1998 until 2002, will be our basic working material and will serve **to extract a causality connection between quality of life, animals' well-being and life expectancy.**

We are well aware that the results will bring no immediate applicable solution. We wish to publish a complete description of the **Dogs' well-being** , studying the variations of the average middle age in relation with the parameters listed above. With the statistic data in hand, we will review them and present our conclusions on the past, the present and the future. There will be no therapeutic protocol, or a definition of the ideal temperature, but a summary that will reflect our common thinking resulting from the analysis of these various parameters. We open the door for a convention with all the people concerned : health professionals, public authorities, owners, stockbreeders, managers,.... with the objective that all the components influencing the animals' well-being, come together, in order to reinforce the solidarity.

We start the study by presenting our method of investigation, together with the various parameters that we will briefly explain. Later, we will present the synthesis of all the various information to determine what globally influence the life expectancy of the domestic dog. Based on this information we will underline the most important parameters. These could be the topic of a further common session as a consequence of the study.

## 1. Method for investigation :

Our study is based on data collected during five consecutive years (1998-2002) by assistants of the association "Animals without Frontiers" from proprietors of dead animals, transported to the incinerator of Boom, and originating from all over Belgium. Our data base contains the information collected for **537 dogs**.

A standard form (annex 2) completed with information provided by the owner or the veterinarian, in charge of the dead body, listed the following information : race, age on the day of deceased, sex, size, weight, year of dead, sterilization, description of the living environment, family size of the owner, eating habits, origin of the animal, suspected cause of dead. The age at the time of dead is indicated for **522 dogs only**. This figure is our reference number.

The data have been introduced in a program (access c; microsoft c) for further use in a statistical analysis program SASc et Statistica c. Our goal was the **study of the middle age variations, as changing factor, depending from the various factors listed above**. We will rate the value of the statistical figures , as **so far as they are significant**. All of the statistical data listed are available in annex 3.

The statistic basic hypothesis (H0) used for each of the parameters, is the absence of difference between the various averages. The base for significativity is 95%, as usual. If a result shows :  $P > F : .0001$ , this means that the probability for error is 1/10.000

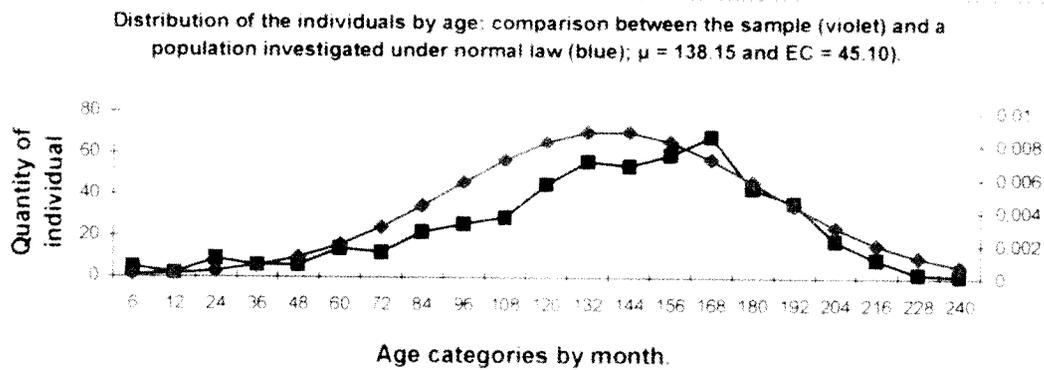
The collection of data, initiated in 1998, continues. But, even if we have data available for the present year, we have decided to stop with 2002, to follow the calendar year (January to December). A few parameters are listed with more or less information, this could be a limit for their analysis. When applicable, we will mark these limits, if they exist, for each one of the parameters. In addition to that, the incineration of dogs listed in our data base, is more expensive than the basic destruction method. This reflects a great affection on behalf of the proprietors, and this could differentiate our sample from the average dog population. There is probably an increment, pushing our sample to a higher average, than the real dog population. This could not be avoided at this level. All the dead animals aging less than 6 months are not included in this study.

## 2 Results of the study

### 1. General statistical parameters.

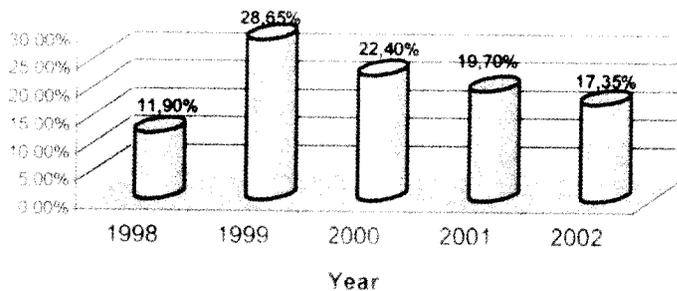
We will study first the quality of the samples, to know, from the start, its limits. Indeed these could very well greatly influence all of the parameters.

a. Normality of the samples studied



With this graph, we wish to verify if the sample, and by extrapolation, the total dog population, behave like normal populations. Even though there is a "graphic tendency" **this normality is not confirmed by the statistics**: this could be explained by the multiple selection exercised by the man on the dog population. Indeed, the man will select, following his own criteria, the members of this population. This selection could begin at the start of its life, by the selection of pets looking wealthy, or by the end of its life through euthanasia. In addition, there is probably an increment in our sample, taking into consideration its privileged character, as outlined before. This could explain the move of the summit of the violet curve to the oldest ages (move to the right)

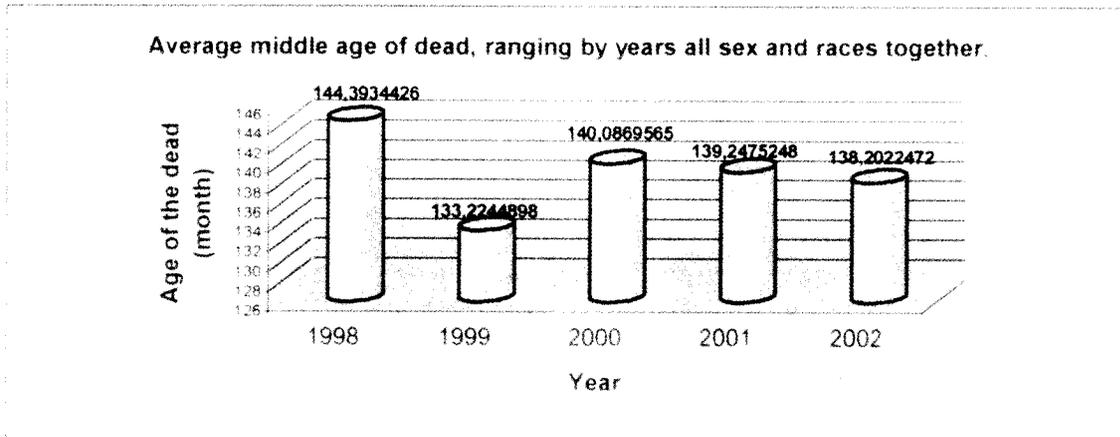
b. Percentage of individuals following the reference year



The percentages of individuals, following the reference year, are different on the graph, and the difference is great (*Chi-square 41.2235, DF 4,  $P > ChiSq < 0001$* )

The average middle age calculated by year fluctuates with the number of individuals: how more we have individuals, how closer we reach the real average of the population under investigation. The data for 1998 are the smallest in terms of quantity: certain months were not listed during the collection of data. But we have enough data, on a yearly basis, to be in line with the average of the sample

c Middle age of dead following the year, all sex and races together

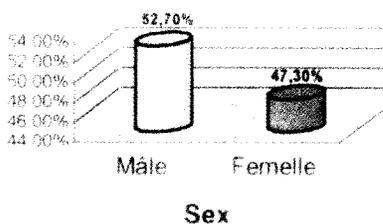


The study of the age evolution of the dead following the years is important, and gives us the possibility to visualize the general trend. **Counting all the years, all races and sex together, we reach an average of 138.15 months, based on the data collected for 522 individuals for which the age was listed.** From the graph we point flexible differences and particularly from 1999 and the following years. After the statistic program application, **there is no great difference between these various years.** The number of individuals, more or less important for the year 1998 and 1999, has no significant influence on the average middle age calculated. This means that the **average middle age of the dead remains constant during the years concerned** : there is nevertheless a slight tendency for a constant increase of the age of the dead. The graph shows that the error space in the linear decrease, gives negatives as positives values.

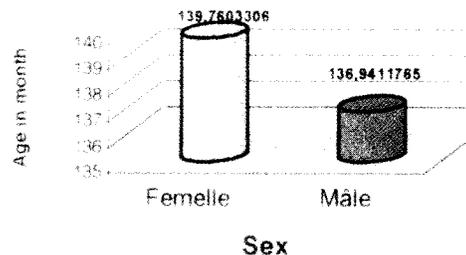
2. Study of the influence of the intrinsic parameters related to the animal on the average age of dead : i.e. sex, race, size, and weight.

a Influence of the sex of the animal on the average age of dead.

Percentage of dead animals depending on the sex



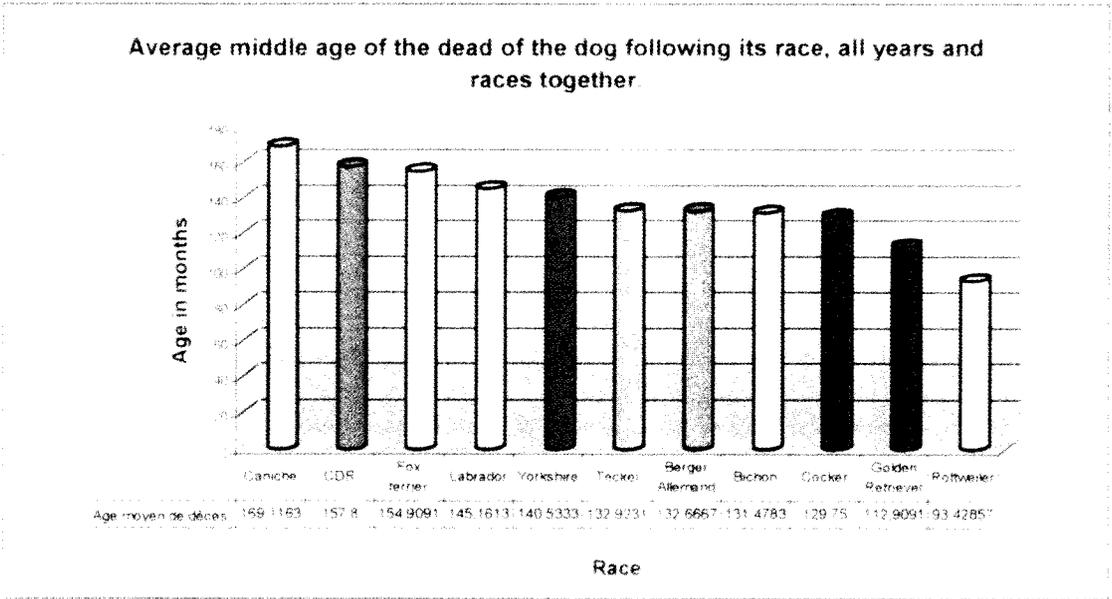
Average middle age of the dead, all races and years together, depending on the sexe.



As shown before, the dog population, and of course, our selection, do not behave like a standard human population. The human population will aim to behave in harmony, as it has been subject of a little or none selection. In addition, the medicine increases the average middle age of the dead, and, for the human population, we don't talk about euthanasia, as we do for the dog. The two graphs show a difference in the ratio of dead between male and female as well as for the age of the dead, for each of the two sexes. Even if this difference exists, it has no significant meaning. It shows, in the first instance, that there are as many male as female dogs who die, and that the female do not live longer than male.

domestic dogs. This is not the case within the human population. The influence of the sterilization on the average age will be part of a further investigation, within the intrinsic factors of the animal

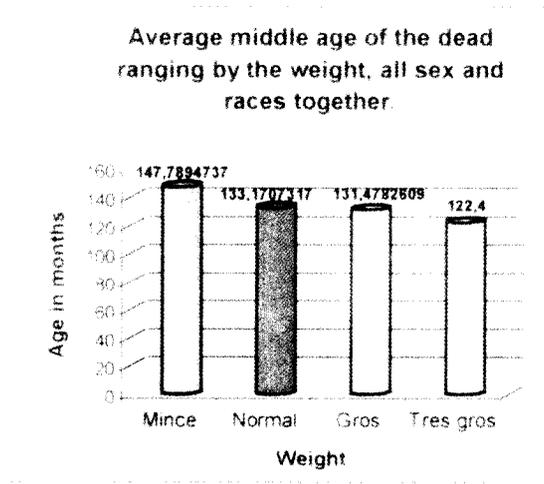
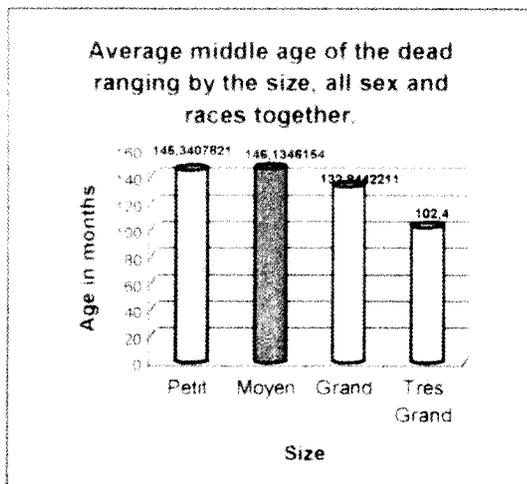
**b Influence of the race of the dog on the average age of the dead.**



The race together with the size is one of the intrinsic parameters of the animal, which has the greatest influence on its life expectancy ( $F Value = 5.46$ ;  $Pr > F < 0001$ ). The quantity of races in our samples amounts to 74. We excluded the dogs with no indication of race and mix breeds. We decided to select only the races with a minimum of 10 representatives, first to obtain a significant average age of dead, second not to over charge the graph

The difference in the age of the dead is meaningful, especially if we compare the two extremes. The Poodle and the mix breeds are the winners, the Rottweiler the loser. The racial selection, induced by the man, even if it is intrinsic to the animal, modifies its life expectancy. The race, even if it is partially marked inside the genetic inheritance or genotype of the animal, is also influenced by other factors such as the size and the weight. These two are related to the race of the animal and have a great influence on the average age of dead. We will study later the influence of these two factors

**c Influence of the size and weight of the animal on the average age of dead**



It is difficult not to analyze these two parameters subjectively. To correct that, we have compared the information contained on the "Dogs identification sheet" together with the accepted objective standards for size and weight, of each race. We noticed no significant differences. We have not corrected the information. For example, if the size of a Labrador is listed as big, we have introduced this information, in order not to modify our data base.

For the **size**, We listed the dogs in 4 categories

- 2 **Small** : Poodle, Toy dog, Yorkshire
- 3 **Middle** : Border, Collie
- 4 **Big** : Labrador, German Shepherd, Rottweiler
- 5 **Very big** : Pyrenees mountains, Big Danish dog

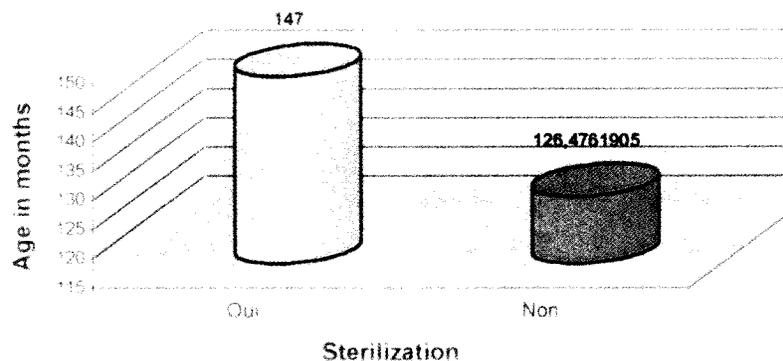
The size has a significant influence ( $F Value : 10.39 ; Pr > F < 001$ ), but is not attached to the race factor, as we can notice with mix breeds. The life expectancy moves in the opposite direction of the size. We could explain this with the osteo- articular problems or even heart problems, which could be found with the big dogs. This is in accordance with the general perception by the human population.

Even if the weight or "the obesity condition" is influenced by the food, it is, in the first instance, an intrinsic factor of the animal ( the probability of overweight is greater with certain races, like the Labrador, the Cairn Terrier). It is clear that **how much an animal weighs, relates to how short is its life expectancy**. We can only describe this as a tendency, because the differences are not clearly marked in the statistics. In any case, the obesity is, widely pointed in veterinarian as well as human medicine, as a very important risk factor for all endocrinian pathologies such as sugar diabetes, cardiovascular pathologies and osteo-articular pathologies such as the hip dysplasia. (Marianne Diez et Louis Istasse. Alimentation des carnivores domestiques. Faculté de Médecine Vétérinaire de Liege)

### 3 Study of the influence of extrinsic parameters of the dog on the average age of dead : Sterilization, Housing, Family environment, Origin and Food.

- a. Influence of the state of sterilization on the average age of dead

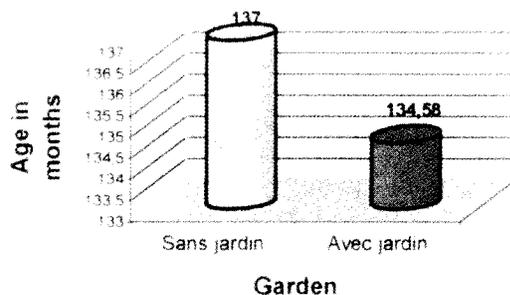
Average middle age of the dead of the dog, all sex, races and years together in relation with the sterilization.



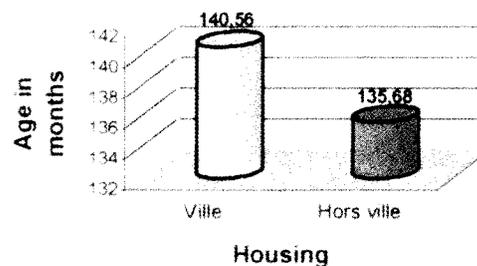
It is clear that, for the dog race, the sterilization raises on a significant manner the average age of the dead ( $F value : 7.3353 ; Pr > F : 007742$ ). Consequently, it is a **protection factor** for this species. The influence of hormonal related diseases, such as mammal tumors for the female or prostatic carcinoma for the male, very often at the origin of euthanasia, will be notably reduced.

- b. Influence of the housing on the average age of dogs' dead. Garden/no garden - City/country

Average middle age of the dead, all sex, races and years together, in relation with the access to a garden.



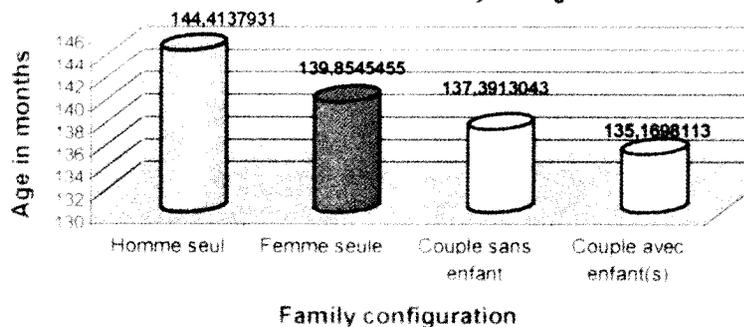
Average middle age of the dead, all sex, races and years together, in relation with the housing.



We noticed a small difference between the two parameters. But it is not significant for pets having access or not to a garden, or for pets living in town or in the country. In order to have a better vision, it would be necessary to subdivide each category, in order to better target them. Indeed, the city could be for example beneficial, as a veterinarian is always available in the vicinity. But pollution and street accidents are additional risks. The same will apply for the country. The dog will eat some grass, useful for the digestion, he will run and develop its physical activities, but the garden could also be the origin of certain infectious pathologies, bacterial or parasitical diseases.

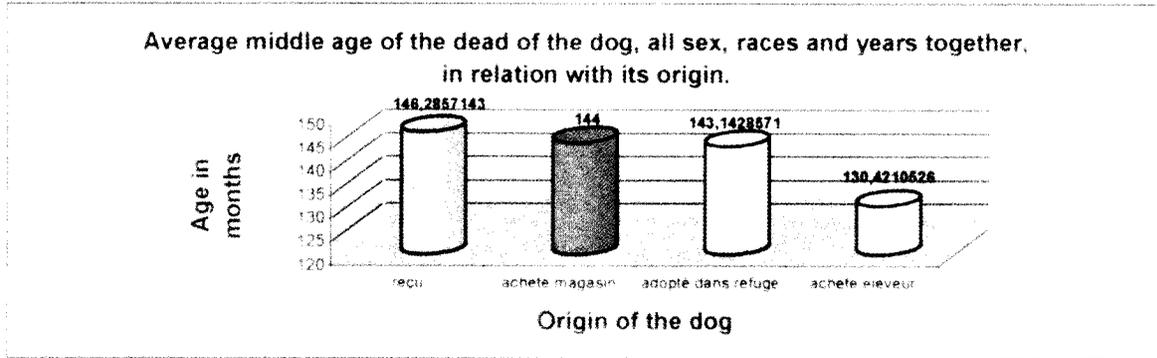
c Influence of the family size of the owner on the average age of dead

Average middle age of the dead of the dog, all sex, race and years together, in relation with the family configuration.



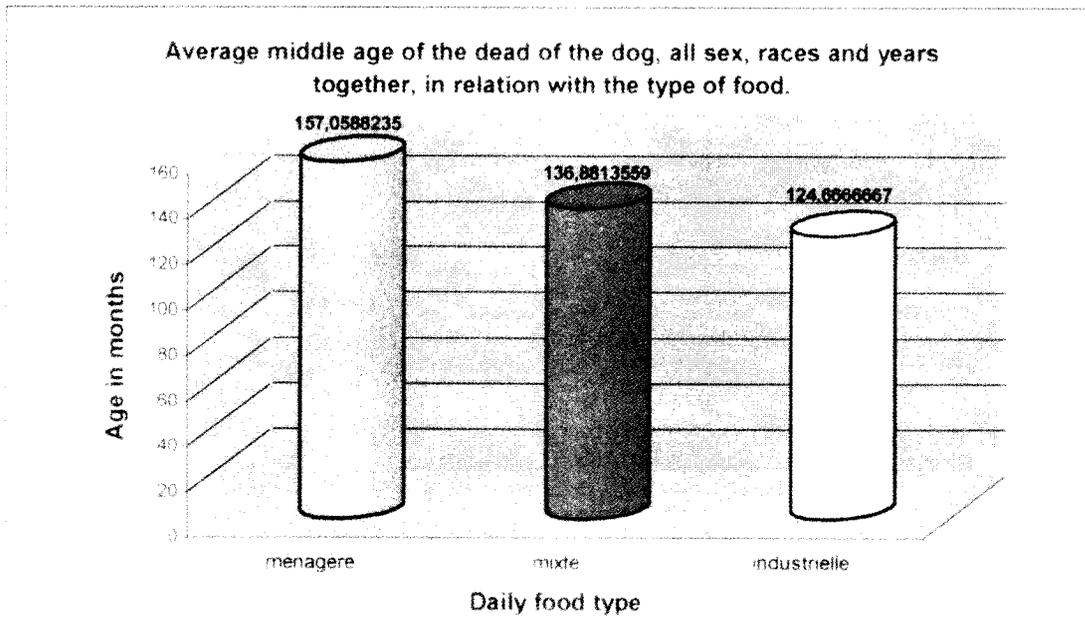
As we can see the average life expectancy do not vary much from one category to the other, even for the two extremes. This parameter was not sufficiently represented in our study. **The difference between these categories is not relevant.** We can nevertheless read a tendency in the graph and we will try to explain it. With a single woman, with a dog, the transfer of the motherly feeling as well as the frequent anthropomorphism can be important; we notice this frequently during our visits. As a consequence, the animal will be over protected, these dogs will very often develop behaviour pathologies such as hyper affection, which will be a stress factor for the animal. This attention may also be positive as it may help to discover other new illnesses. A single man will consider his dog, just as a friend; the stress will be lower.

d. Influence of the origin of the dog on the average age of dead



The statistics are not significant for this parameter. It is understandable, as the environment, at the time of the acquisition, may no longer be remembered at the time of the dogs dead. Consanguinity in a kennel could be an important factor in the transmission of hereditary illness, this could theoretically be a factor of risk. The dogs, below the age of 6 months, are not counted in the study. They are the ideal population for the transmission of infectious pathologies, especially in shops, where the "parvovirose" is well present and this would reduce the general average figure.

e. Study of the influence of food served to the dog on the average age of dead.



We took into consideration three categories of food

- 1 Home made : With products used from the owner's meals
- 2 Mixture : A mix of home made and industrial food.
- 3 Industrial : Retail sold dogs food

The difference between the 2 extremes amounts to more than 32 months.

( approximately 3 years) This difference is important ( $F$  Value : 6.67 ;  $Pr > F$  : 0017)  
Food is consequently of great importance for the life expectancy of the dog. **We can consider that home made food is a protection factor for the domestic dog.**

## Conclusion :

The objective of this study is to question our self on the real impact, of each of the parameters, intrinsic and extrinsic to the dog, on the specific and individual life expectancy.

A small poodle, with home made food, sterilized, living in town with a single person, will have more chances to live longer. This is not the case for a Rottweiler, with canned food, not sterilized, living in the country with a family with children.... This does not appear in the statistic.

Based on our investigation, the **race and the size**, that we have listed as intrinsic to the animal, **have a definite basic influence on the life expectancy** of the animal. (less than 1 out of 10.000 to be wrong. The significance bottom line, for these two parameters, is 95 %). **These factors cannot be converted into a module.** You cannot give an advice for selecting a dog, based on a longer life expectancy. **These factors cannot be modified.**

As a consequence **we would and must act on the extrinsic parameters of the animal**, when possible. These will influence directly the quality of life and the well- being that the dog may expect to receive from its owner, (Annex 1) based on his own possibilities, moral and material, but also the factual information that we have to provide.

Sterilization, medical or surgical, remains an important factor for the dogs against tumorous or infectious illnesses of the genital organs for female as well for male (7.7. chances out of 10.000 to be wrong, with a significativity bottom line of 95 %). As such it is recommended to practice it, but we do not take into consideration the restriction in terms of reproduction.

The **social environment and housing play little role on the dogs' life expectancy.** Indeed, the dog and the man have lived together for a long time. The selection, operated by the man, has transformed the dog as an animal **well adapted to its life environment**, i.e. ours of course ! The dogs, if we study a number of parameters, are today far away from the wolves. **Domestication has certain advantages.** Not only advantages but also constraints. **Diet** is one of them **especially for meat eating animals**, but less of an importance for the domestic cat.

The essential nutritional needs must be covered in terms of quantity and quality.  
The analysis shows clearly (1.7 chances out of 10.000 to be wrong, with a significativity bottom line of 95 %) that, the animals who receives varying home made food, will have the benefit of a longer life expectancy. This is probably a consequence of the basic quality of the food, and its better absorption as natural nutritional food. **These characteristics could be missing with industrial canned food, as a consequence of the various physical treatments** (High temperature, lyophilisation, extrusion, flaking,...) **or chemicals** ( hydrolysis, food additives...) **and also the basic quality of the ingredients** ( quality of the basic protein, vegetable protein for meat eating animals, vitamin, difficult to assimilate, low digestibility, solvable sugar present in large quantity....)  
High sensitivity with food and dermatological problems related with it are frequent reasons for a visit to the veterinarian. (1% of the dermatosis examined in our daily practice, 10 to 20 % of the dermatosis as a consequence) and the number raises continuously.

It is **essential** that we develop a compromise between the **"rights of the animals "and the "obligations of the man."** Between our **obligations and the basic needs of the animal.** The evolution and changes in the human race, with the correlated changes for the animal (change in housing layout, dogs left alone, reduction in the time spend for walk ..) cannot, for these reasons, neglect the fundamental living requirements. **This compromise requires a closer attention on behalf of the proprietor for the nutrition of his companion**, even if the canned

industrial food gives an additional comfort.....to the proprietor.

The nature reasserts its right and shows its value and its presence. In view of the dominating importance of the food and its quality, in the frame of our study on the dogs' life expectancy, it looks essential that scientists, managers, veterinarians, and proprietors, meet and discuss together in order to answer the nutritional requirements of the animal, and consequently its **WELL-BEING**.