Chapter 5

Conclusions, Limitations and Recommendations

With completion of the one-way ANOVA with the F Ratio and correlations, there is sufficient evidence to reject the null hypothesis in favor of the alternative hypothesis

5.1 INTRODUCTION

In Chapter 4 the data obtained from an in-depth search of the literature was presented. The search of the literature included:

- College and university library searches of medical and scientific data bases
- A medical library search of the medical journals for medical and scientific articles
- E-mail correspondence with scientists in the field
- Internet web-based searches of appropriate agencies, such as the World Health Organization and the Centers for Disease Control and Prevention

The data obtained included:

- A number of different types of surveillance systems
- Case fatality rates
- Prevalence rates
- Incidence rates
- Incidence
- Prevalence

Additionally, results of the one-way Analysis of Variance, F ratios, and correlations were mathematically calculated and presented. A one-way ANOVA was performed on four diseases: AIDS, SARS, Ebola virus, and Group B Streptococcus (GBS), an anthroponosis, using case fatality rates as dependent variables and the number of surveillance systems as an independent variable. The F ratio was used to test the H_0 (null hypothesis). If α = .05, the null hypothesis is rejected.

Correlations were also performed using incidence rates as dependent variables and the number of surveillance systems as an independent variable. A negative correlation was observed. Additionally, correlation studies were also performed on South African Provinces 2002 HIV incidence rates and prevalence rates (Health Systems Trust 2004:1-2). There is a **positive correlation** between HIV incidence rates and prevalence rates: r = .825 N = 9 critical value = .666 (Level of significance for two tailed test at .05 criterion).

'As incidence rates decrease so do prevalence rates, and as incidence rates increase so do prevalence rates'

In this chapter a summary of the findings of this research will be presented, including recommendations by the researcher.

5.2 SUMMARY OF FINDINGS

Additional factors could be involved in causing a decrease in case fatality rates and a decrease in incidence rates. These are the possible factors: new drug discoveries, improved lifestyle, health awareness, HIV/AIDS awareness and new vaccines and immunizations. A few possible negative aspects of all this could be outbreaks of newly emerging infectious diseases, recrudescence of more resilient diseases, an utter disregard for the safety precautions necessary to prevent the spread of HIV/AIDS and an increase in intravenous drug abuse. The statistics provide sufficient evidence to reject H_0 (null hypothesis) in favour of H_1 (alternative hypothesis). There is a ***negative***

correlation between incidence rates and the number of surveillance systems, indicating that:

If the number of surveillance systems increases, it is likely that the incidence rates will decrease. It is just as likely that if incidence rates are increasing then the number of surveillance systems may be inadequate.

There is also a ***positive correlation*** between incidence rates and prevalence rates.

The positive correlation between HIV incidence rates and prevalence rates indicates that if incidence rates decrease, prevalence rates will decrease and if prevalence rates increase, incidence rates will increase.

Therefore, it can be concluded that:

- ***If the number of surveillance systems has an effect on case fatality rates***
- ***and there is a negative correlation between incidence rates and the number of surveillance systems, then***
- ***an increase in the number of surveillance systems will have a direct positive impact on the prevalence rate,***

- ***since there is a positive correlation between incidence rates and prevalence rates.***

An increase in the number of surveillance systems is likely to have an effect on zoonoses and/or anthroponosis, and will at least limit emergence by decreasing incidence rates, prevalence rates, and case fatality rates.

A one-way ANOVA was performed on four diseases: AIDS, SARS, Ebola virus and Group B Streptococcus (GBS), an anthroponosis, using case fatality rates as dependent variables and the number of surveillance systems as an independent variable. The F ratio was used to test the H_0 (null hypothesis). If α = .05 the null hypothesis is rejected. The one-way ANOVA results were as follows:

5.2.1 AIDS

F Ratio = 5.787276124

Critical values are 4.41 at α=.05 criterion of significance

and 8.28 critical value at α = .01 criterion of significance

5.2.2 SARS

F Ratio = 5.249083982

Critical values 4.41 at α= .05 criterion of significance and 8.28 critical value at α = .01 criterion of significance

5.2.3 EBOLA

F Ratio = 6.354258103

Critical values are 4.35 at α = .05 criterion of significance

and 8.10 at α = .01 criterion of significance

5.2.4 GBS

F Ratio = 14.58409229

Critical values are 4.41 at α= .05 criterion of significance

and 8.28 at α = .01 criterion of significance

Using the computational tables for critical values of F (α = .05 and α = .01), F values were determined for each of the emerging infectious diseases by using the degrees of freedom calculated for each emerging infectious disease. That is, degrees of freedom for both within-groups and between-groups error. Values of F less than 1.0 would automatically indicate that H_0 (null hypothesis) should be retained. Since all F values are greater than 1.0, this indicates that the H_0 (null hypothesis) be rejected in favour of the H_0 (alternative hypothesis). Additionally, since the obtained F values are larger than the critical values (at α = .05) obtained from the table, the H_0 (null hypothesis) is rejected in favour of the H_1 (alternative hypothesis):

'Active surveillance will have an effect on zoonoses and/or anthroponosis in that it will prevent or at least limit emergence'

Correlations were also performed using incidence rates as dependent variables and the number of surveillance systems as an independent variable. A negative correlation was observed.

The correlation coefficient is symbolised by the letter *r*. This coefficient is often referred to as the Pearson *r* in honour of Karl Pearson, a British mathematician, who did the early work on this measure starting with an idea of Francis Galton (1822-1911), a British anthropologist and meteorologist and cousin of Charles Darwin. The correlation coefficient has the following desirable characteristics:

- a value of zero indicates no linear relationship between the two variables (that is, they are **linearly uncorrelated**).

- the size of the numerical value of the coefficient indicates the strength of the relationship (large absolute values mean that the two variables are closely related).

- The sign of the coefficient indicates the direction of the relationship.

- The largest possible positive value is +1.00 and the largest possible negative value is -1.00.

  (Welkowitz *et al* 1982: 177).

The effectiveness of various types of surveillance systems on specific emerging infectious diseases by country is a massive research project but could prove useful in eliminating weak and ineffective surveillance systems and in the long run could save lives.

5.3 RECOMMENDATIONS

5.3.1 General Recommendation

If countries, localities, municipalities, *et cetera*, want to have an effect on zoonoses and/or anthroponosis by way of the case fatality rates, and to limit emergence, it behooves them to increase the number of surveillance systems and phase out ineffective and weak systems. Yearly surveillance systems effectiveness reviews should be done by the appropriate authorities and ineffective surveillance systems should be phased out.

5.3.2 Specific Recommendations for Epidemiologists

Epidemiologists study the distribution and determinants of health-related states or events in specified populations, and apply this study to control health problems. "Study" includes surveillance, observation, hypothesis testing, analytic research and experiments (Last 2001: 62). Should epidemiologists want to reduce recrudescence and lower case fatality rates, they should look for trends in the data that could indicate possible future problems. That is, if data is collected. For example, suppose the data shows that there are many cases of fever occurring in a particular locality near animals. This should be a 'red flag' and require further investigation to see if there is any relationship of the fever to the animals.

5.3.3 Specific Recommendation for Medical Practitioners

Medical practitioners—doctors, nurse clinicians, physician's assistants, and nurse practitioners—treat the sick. They should be especially alert to repeating medical cases of similar symptomatology. This could be indicative of the spread of an infectious disease. A repeated number of cases of respiratory distress was indicative of the spread of Severe Acute Respiratory Syndrome (SARS).

5.3.4 Specific Recommendation for Veterinarians

Veterinarians treat illnesses of animals. They must be especially alert to animal illnesses. It was just recently discovered that dogs had seroconverted after eating dead animals infected with the Ebola virus (Allela *et al* 2005:1-7). Although the seroconverted dogs were asymptomatic, it is possible that they may have been implicated in an Ebola virus outbreak.

5.3.5 Specific Recommendation for Health Care Workers

Health care workers would include nurse assistants, registered nurses, vocational nurses, medical assistants, and medical ancillary service workers like laboratory and radiology workers. In order to protect health care workers from infectious diseases, and minimise any impact caused by them, all health care workers should be vaccinated and immunized whenever possible. Anthrax vaccinations are currently available. Smallpox immunizations are also available. Research is currently being conducted on the development of an Ebola vaccine and a SARS vaccine. All health care workers should follow standard precautions applicable for:

- ✓ Blood
- ✓ All body fluids
- ✓ Secretions
- ✓ Excretions, except sweat
- ✓ Non-intact skin
- ✓ Mucous membranes

Barrier protection as applicable to ***Transmission categories*** should be followed for

- Airborne precautions

- Droplet precautions

- Contact precautions

5.3.6 Specific Recommendations for Animal Care and Farm Workers

Animal care and farm workers should be very attentive to the animals under their care. If many animals become ill, this should be reported to the supervisor, as it could be indicative of an enzootic disease. Additionally, if several animal care and/or farm workers become ill, this could be indicative of a zoonosis.

5.3.7 Specific Recommendations for the General Public

- Wash and disinfect hands after handling animals as a first line of defense against transmission of disease.

- A veterinarian should treat sick pets as soon as possible.

- A medical practitioner should see sick patients as soon as possible

- Use protective clothing and barriers

- Maintain environmental hygiene
- Disinfect and sterilize
- Filtrate
- Boil
- Pasteurise
- Bake with dry heat
- Use chemical disinfectant
- Disinfect by exposure to sunlight
- Clean, disinfect and sterilize equipment thoroughly
- Maintain a high level of personal hygiene for both the patient and caregiver

5.4 CONCLUSIONS

The alternative and null hypotheses are as follows:

The alternative hypothesis (H_1):

Active surveillance will have an effect on zoonoses and/or anthroponosis in that it will prevent or at least limit emergence.

The null hypothesis (H_0):

Active surveillance will not have an effect on zoonoses and/or anthroponosis and will not prevent nor limit emergence.

Statistical analysis provides sufficient evidence to reject H_0 in favour of H_1.

The researcher decided, following in-depth discussions with the statistician, to use the number of surveillance systems as opposed to the specific types of surveillance systems when doing both the one-way ANOVA and correlations. The number of surveillance systems appeared to be important, though several passive surveillance systems would not be as effective as several active surveillance systems. Since data are more accurate in an active surveillance system than in ether passive or sentinel surveillance systems (Lilienfeld and Stolley 1994: 104-105), several active surveillance systems would be more effective than several passive surveillance systems. Additionally, manipulating the number of surveillance systems is likely to have an effect on the case fatality rates. It would appear the more surveillance systems the better.

Emergence of zoonoses was statistically proven to be limited by the number of surveillance systems and its relationship to incidence rates.

The negative correlation suggests that, given a greater number of surveillance systems, the incidence rates will slow or decrease.

The positive correlation between HIV incidence rates and prevalence rates indicates:

- if incidence rates decrease, prevalence rates will more than likely decrease, and
- if prevalence rates increase, incidence rates will more than likely show an increase.

- therefore it follows that if the number of surveillance systems has an effect on cases fatality rates,

- and there is a negative correlation between incidence rates and the number of surveillance systems, then

- an increase in the number of surveillance systems would have a direct impact on the prevalence rate,

- since there is a positive correlation between incidence rates and prevalence rates.

In this chapter a summary of the findings was presented with the researcher making a general recommendation and specific recommendations for epidemiologists, medical practitioners, veterinarians, health care workers, animal caretakers, farm workers, and the general public.

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