ABSTRACT

This study carries forward the exploration of the need for additional initiatives to enhance vaccination uptake against hepatitis A infection in child care workers in the Bundaberg region. The purpose of this quantitative study was to identify the self reported hepatitis A immunisation levels amongst workers in long day care (LDC) centres. The study set out to evaluate by survey, the awareness levels of National Health and Medical Research Council (NHMRC) recommendations for hepatitis A immunisation of workers, compare reported hepatitis A levels with self reported hepatitis B immunisation levels and centre practices in relation to policy, record keeping and centre director and worker risk perception. The study was conducted as a confidential postal survey between July and September 1999, by purposive sampling with questionnaires of 163 workers and 15 centre directors. Although a majority believed their occupational situation placed them at increased risk, only 34.3% of workers were immunised against hepatitis A. Changing nappies of children on a weekly basis was reported by 72.4%. While twice as many workers were reportedly immunised for hepatitis B than hepatitis A, only half had subsequently undertaken serological testing to confirm hepatitis B post-vaccination immunity. Most workers perceived their occupation placed them at increased risk of infection and were aware of NHMRC recommendations for immunisation, but failed to translate this to vaccination uptake against hepatitis A. Only one centre reported a policy for staff immunisation, while 93% had policies for children. Record keeping was reportedly inconsistent across surveyed centres, with irregular updating and identified a need for further policy and educational and training initiatives for improvements at regional LDC centres. Findings confirm a lack of awareness of NHMRC recommendations. The study suggests a continuing misconception of greater risk of hepatitis B than hepatitis A. Approximately 25% of surveyed workers were in favour of either free immunisation or some form of government or employer subsidised immunisation program for child care staff. This dissertation established a set of regional data on current hepatitis A awareness and self reported immunisation levels in LDC centres.

SELF-REPORTED HEPATITIS 'A' IMMUNISATION AMONGST CHILD CARE WORKERS IN THE BUNDABERG REGION

(A Cross Sectional Study
of
Long Day Care Centres)

Dissertation submitted in the Faculty of Arts, Health and Sciences,
Central Queensland University,
as partial requirement for the Degree of
Master of Occupational Health and Safety.

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29 JUNE, 2001

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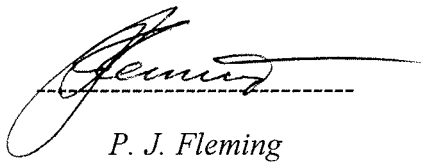
P.J. Fleming

DECLARATION

The text of this dissertation is original work, generated by myself, under the guidance of my supervisors and does not contain any work previously undertaken by myself, for any other project. All information from other sources has been acknowledged as required through intext referencing.



P. J. Fleming

CHAPTER 1

INTRODUCTION

The day care of children throughout Australia has expanded greatly in recent years. It affects not only children and their parents, but also families, employers, employees and governments at all levels. It is an often stated cliché, but a nation's greatest asset is it's people, and child care is instrumental in bringing out the full potential of both children and their parents.

Following the 1996 Census, the Australian Bureau of Statistics (ABS) reported that as at March 1996, there were 1,501,800 children aged less than 12 years using some type of formal or informal child care within Australia (ABS 4402.0 1997). This represents 48% of all children in this age group. In her earlier study, June Wangman (1995 p. 2) commented on that expansion by stating that over the last ten years child care had emerged: '.....from a rather isolated government policy area to one that is integral to the achievement of the Commonwealth Government's social and economic objectives'. Direct links now exist between children's services and major government programs. The forces which have led to this increase in demand for places in formal and informal care for young children, toddlers and infants continue to spread their influence. Some of these include changing societal values of the family, the encouragement of women to re-enter the workforce to either fulfil career aspirations or financial commitments, the increase in the number of single parents, increases in social stresses experienced by parents and lastly, the mobility of the modern family (ABS 4402.0 1997; Wangman 1995; Watts & Patterson 1984).

From the 1996 Census, the ABS further reported that the most commonly used formal care for children was pre-school, attended by 32%

(200,600) of children using regulated care away from the child's home. This was followed by long day care with 177,700 (28%) children. On the other hand, the 1996 Census also reported that 1,128,300 children used informal care, a figure which represented 36% of all children under the age of 12 years of age in some form of non-regulated care (that is, in the child's home or elsewhere). The Economic Planning Advisory Commission (EPAC), in their 1996 Task Force Interim Report "Future Child Care Provision in Australia", stated that getting those child care arrangements right plays a vital role in Australia's social and economic development (EPAC 1996a). Clearly then, there are no signs that the current need for child care workers and child care programs is diminishing. As the child care industry continues to thrive, people and those in authoritative positions such as governments are increasingly under pressure to document outbreaks of notifiable diseases in communities where there is close person to person contact. It has been suggested by the Department of Human Services and Health (DHSH) and others that diseases encountered by staff in day care settings vary from serious infections such as meningococcal, respiratory and enteric infections such as gardia and rota virus to viral infections such as hepatitis A and hepatitis B (DHSH 1994; Ferson 1993; Lee & Bishop 1997).

The National Health and Medical Research Council (NHMRC) state that hepatitis A, a vaccine preventable disease, has reported an average of 2000 cases annually in Australia in the five years, 1992 to 1997 (NHMRC 1997). The NHMRC (2000) further advise that certain groups of people are prone to be affected by hepatitis A virus. One of these groups comprise child care centre and pre-school workers, because they are likely to come in contact with human faeces, they are susceptible to intense transmission among themselves, and are able to serve as a potential source of transmission to the broader community (Gust 1994; NHMRC 2000). The intensifying effect of the child care setting is particularly evident during community-wide outbreaks. The NHMRC (1997) advise that individuals caring for young children in day

care centres, particularly where the children are too young to have been toilet trained, are considered to be at high risk of hepatitis A exposure. Person to person spread is more likely to occur in these settings because of the close contact between children who are not toilet trained and staff members who practice poor hand washing techniques (McCance & Huether 1994).

Hepatitis A is a liver disease caused by the hepatitis A virus (Gurevich 1993; Battegay, Gust & Feinstone 1995; Melnick 1995; Mitchell 1990; NHMRC 1997, 2000). The virus can affect anyone and has worldwide distribution (Gust 1992b; Melnick 1995). It is a disease that poses major health concerns to humankind and results in significant morbidity and illness throughout the world (Amin, Heath & Morell 1999; Gust 1992a; Lee & Bishop 1997; NHMRC 1997, 2000; Specter 1999). Mortality is believed to be very low at less than 0.5% of cases (Benenson 1990; Gerety 1984; Tortora, Funke & Case 1986; Smales 1998). Outbreaks of hepatitis are known to occur because of faecal contamination of food and water, and are an important source of food-borne disease (NHMRC 1997, 2000). In fact Ferson (1993) suggests that hepatitis A virus infection is endemic worldwide stating that hepatitis A may go unrecognised particularly in young children, because over 80% of infections in one to two year olds and 50% of infections in three to four year olds are asymptomatic or do not show any symptoms of disease, making it difficult to determine whether the disease is present or not. Shaw (1999) suggests that in every country the asymptomatic nature of the infection causes hepatitis A to be under-reported. In age groups where standards of hygiene are not fully developed it has been clearly established that asymptomatic infection poses a risk of disease transmission (Zucherman 1999). There is no chronic carrier state with hepatitis A because having had the disease produces lifelong immunity from future Hepatitis A virus infection (Battegay et al. 1995; NHMRC 1997, 2000; Shaw 1999; Smales 1998; Stapelton 1999).

Hepatitis literally means inflammation of the liver and can be viral or

toxic, that is, caused by various drugs (Black 1996; Chowdry 1993; Tortora et al. 1986). While viruses are the most significant cause of hepatitis, excessive use of alcohol and drugs can contribute to this relatively common systemic disease (McCance & Huether 1994; Smales 1998). Viral hepatitis is caused by a unique group of viruses that only attack the liver (Lee & Bishop 1997). The various forms of hepatitis are currently identified by types classified alphabetically *'A to G'* (Smales 1998). While Specter (1999) agrees with these current classifications he is adamant that this list of hepatitis viruses is not necessarily complete as the list "may yet grow" as diagnostic techniques continue to develop. All of these 'hepatitis viruses', whilst completely unrelated, are grouped solely by the fact that the primary disease they cause is inflammation of the liver (Hodinka 1999; Lee & Bishop 1997; Tortora et al. 1986; Specter 1999).

Of the various forms of viral hepatitis, Hepatitis A is the most common. It was formerly called infectious hepatitis and has also been known as type A viral hepatitis and jaundice (Black 1996; Chowdry 1993; Mitchell 1990; Specter 1999). On the other hand, hepatitis B was formerly called serum hepatitis and is caused by the hepatitis B virus or HBV (Battegay et al. 1995; Jensen, Wright & Robison 1997; Lee & Bishop 1997). Hepatitis A (that is, jaundice) is an ancient disease, with early descriptions by Hippocrates suggesting jaundice or viral hepatitis dating back to the fifth century BC (Gust 1992b; Melnick 1995; SmithKline Beecham 1993; Stapelton 1999). Major outbreaks have been documented down through the ages of humankind. In particular, the disease became a problem within military camps and amongst masses of troops such as during the Napoleonic wars in Europe and the Civil Wars in the USA (Battegay et al. 1995). Poor sanitation, overcrowding and the rapid spread of infection made hepatitis A virus the most likely cause of a large outbreak of epidemic jaundice during the Egyptian campaign of 1799 (Gust 1992b; SmithKline Beecham 1993). It was not until the beginning of the 20th century that recognition of infectious hepatitis as a distinct clinical entity

in its own right occurred (Stapelton 1999). However, it was only after the analysis of large epidemics of hepatitis among troops and civilians (> five million cases) during World War II that clearly established the existence of two distinct forms of the disease (Battegay et al. 1995; Gust 1992b). In 1947, it was MacCallum who proposed calling the two forms of hepatitis; hepatitis A and hepatitis B (Battegay et al. 1995). The hepatitis A virus was finally identified in faeces from humans in the early 1970's, while the hepatitis B virus had been successfully distinguished as a serum or blood virus by Nobel prize winner, Blumberg in the 1960's (Vyas & Yen 1999).

Hepatitis A is well known as an infectious disease (Amin et al. 1999; Gust 1992b; Lee & Bishop 1997; NHMRC 1997 & 2000). Infectious diseases are caused by pathogens or disease producing micro-organisms such as viruses, bacteria and parasites (Bitton 1994; Tortora et al. 1986). To gain access to the body, pathogens use several avenues or 'portals of entry' to penetrate the lining of the mucous membrane of the conjunctiva, respiratory tract, gastrointestinal tract and genitourinary tract (Tortora et al. 1986). For hepatitis A, the preferred portal of entry is the gastrointestinal tract and micro-organisms contracted from food, milk, water and contaminated fingers enter the body this way (Lee & Bishop 1997; Tortora et al. 1986). Humans are considered the main reservoir for the hepatitis A virus, with transmission from person to person by the faecal-oral route (Battegay et al. 1995; NHMRC 1997; Van Damme 1996).

The hepatitis A virus (*hepatovirus* - a member of the *picornaviridae* viral family) survives well in the environment (Battegay et al. 1995; Black 1996; Lee & Bishop 1997; Tortora et al. 1986). It is readily transmitted into the digestive system through the ingestion of viral particles from faeces and saliva in food and drink or by bathing in water contaminated by sewerage. The virus is present in the bowel and is excreted in the stools during the acute phase of the illness (Gurevich 1993). It is known to survive in food and water and when

outbreaks occur, they are notifiable by doctors, hospitals and laboratories in all States and Territories of Australia (Amin et al. 1999, Lee & Bishop 1997). It persists on hands for several hours and in food kept at room temperature and cold storage for considerably longer periods (Gurevich 1993; NHMRC 2000; Shakespeare & Poole 1993b). While the mode of transmission is usually person to person, other common outbreaks can also result from contaminated food or drink handled by infected food handlers and by poor personal hygiene (Jensen et al. 1997; NHMRC 1997, 2000).

Hepatitis A has an incubation period period ranging from 15 to 40 days - average 25 to 28 days (Jensen et al. 1997; Lee & Bishop 1997; NHMRC 1994, 1997). The severity of the illness increases with age and displays a range of symptoms including fatigue, malaise, fever, chills, nausea, vomiting, abdominal discomfort, jaundice (onset within a few days), pain in the liver area, anorexia, dark urine and clay coloured stools (Benenson 1990; Chowdry 1993; Jensen et al. 1997; NHMRC 1994). The illness may extend from one to two weeks to a severe disabling disease lasting several months. Most people recover completely but the illness is usually severe enough to keep adults off work for about 30 days (Lee & Bishop 1997). French studies put the mean number of lost working days for adults at 35 days (Van Damme, Van Doorslaer, Tormans, Beutels, & O'Grady 1995).

The Viral Hepatitis Prevention Board (VHPB) and others suggest the implications from the foregoing disease specifics are that infected people may unknowingly pass the virus to others before they themselves develop symptoms, making the identification of the source of infection difficult (NHMRC 1997; VHPB 1995). There is currently no specific treatment for hepatitis A, although supportive care such as rest and proper nutrition can relieve some symptoms (Black 1996; Chowdry 1993; Lee 1994; Lee & Bishop 1997; Tortora et al. 1986). Lee (1994) and Lee and Bishop (1997) recommend that the best therapy for hepatitis A is prevention by stopping transmission of

the virus and rendering individuals resistant to infection by immunisation. Hepatitis A is vaccine preventable and as such, exposure by workers to the risk of the disease has become a public health issue for both regional health authorities and local government (Amin et al. 1999; Lee & Bishop 1997; NHMRC 1997, 2000; Smales 1998). In regions with poor environmental sanitation and hygiene it is an 'invisible' public health issue with few reported cases (NHMRC 2000). The cost of such losses translates to both the urban community and employers alike. Some costs such as sick leave and loss of productivity are measurable, while the less measurable costs impact upon quality of life, care-givers and medical practitioners. Dr Nick Crofts, MacFarlane-Burnett Centre for Medical Research, Victoria states in the forward to Havrix Clinical Update that: 'Hepatitis A is not a trivial infection personally, nationally or globally' (SmithKline Beecham 1996, p. 2).

In Australia, only a few occupations are associated with significant workplace exposure to hepatitis A virus. These individuals include teachers and carers of the intellectually disabled and workers caring for young, non-toilet trained children in day care centres (NHMRC 1997, 2000). Child care workers can be employed or sponsored by local government authorities or employed by privately owned and managed organisations such as shopping centre management groups, church groups and educational institutions such as Technical And Further Education (TAFE) colleges and Universities.

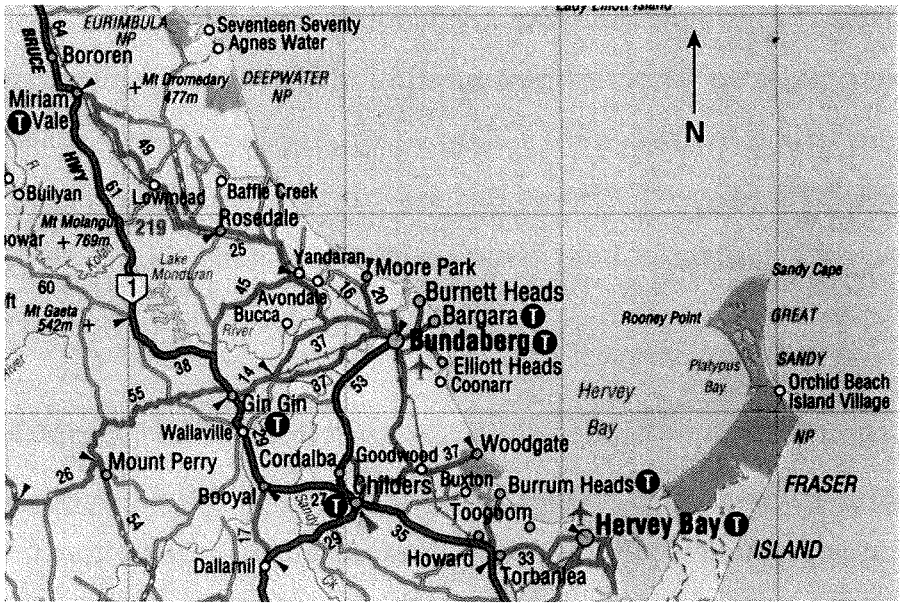
Outbreaks of hepatitis A among young children in day care centres and family members and staff who care for them are well documented and remain an important source of community outbreaks. For example, Amin et al. (1999) identify a number of reports in Australia that continue to raise concern about hepatitis A virus transmission in institutions such as child care centres. Balcarek, Bagley, Pass, Schiff & Krause (1995) cite several U.S. studies that also suggest young children in day care centres are an important source of hepatitis A virus infection for communities. The associated morbidity of

infection in adults who contract hepatitis A virus from this source is significant, with estimations exceeding $200 million annually in the United States. Numerous other Australian studies and investigations confirm outbreaks that have resulted in the spread of infection not only to younger and older siblings, other household members including parents and grandparents but also to staff members such as carers and nurses (Davison, El-Saadi, Longhurst & Kassulkie 1996; Ferson, Young, Robertson & Whybin 1994; Hanna 1993; Heath, Lovegrove, Westley-Wise & Roberts 1997; Tallis, Veitch & Harries 1996).

Previous research has also observed that hepatitis A outbreaks in children at child care settings do serve as a potential source for transmission to others in the community (Desenclos & MacLafferty 1993; Hadler & McFarland 1986; Mullin & Stehr-Green 1991; Thomson, Kennedy & Thompson 1998). In February 1998, the Central Public Health Unit Network (CPHUN) confirmed a hepatitis A outbreak amongst indigenous communities in Central Queensland (CPHUN 1998a). Approximately 31 cases were notified and most were able to be traced back to person to person spread from other known sources. Interestingly, a common factor had been transmission of the disease to others by children, particularly those attending a day care centre in the community. The CPHUN (1998b) state that hygienic measures and immunisation remain fundamental to outbreak control.

Following further reports of recent regional outbreaks, concern about the transmission of hepatitis A in child care centres in general was expressed by staff from the CPHUN at Rockhampton, Queensland. CPHUN is the health authority responsible for collecting and circularising communicable disease surveillance data for Central Queensland. This Unit was enthusiastic at the prospect of a study involving child care workers at long day care centres. Further personal communications with CPHUN revealed that a proposed study of the Bundaberg region would be opportune and provide a 'snap-shot'

of this region. Bundaberg is located geographically midway between Central Queensland and the Sunshine Coast. The location for the study within the Bundaberg region is illustrated at Map: 1.1 (*Explore Australia* 1994). To the researcher's knowledge, there was no empirical data available on the current levels of immunisation against hepatitis A or awareness amongst child care workers in long day care centres in the local Bundaberg region and that is what needed to be investigated.



Map 1.1: Map of the study location in the Bundaberg region.

Both the researcher and CPHUN view awareness and adherence to NHMRC recommendations for immunisation of workers as key factors in ascertaining if improvements may also be needed in the training area, as revealed in personal interview with Dr. R. Taylor (CPHUN) on 29 May 1998. It was therefore thought to be important to investigate just what the actual levels of awareness of those NHMRC recommendations might be in this particular group of workers. In particular, the study may provide answers to the question, how many more people are there in the child care community, with scant awareness of the importance of the NHMRC recommendations for immunisation and who haven't been immunised? Such questions need to be

answered. As Professor Geoffrey Rose stated in his forward to the first edition of Epidemiology (Christie, Gordon & Heller 1997, p. vii), because questions provide: '....the starting point for medical planning, setting priorities and making better use of our efforts and resources'.

Amin et al. (1999) in their review of future directions, further suggest amongst a range of other issues, that policy issues by authorities may also need to be tailored to more regional epidemiology in order to control hepatitis A. This could be particularly important for regional decision makers in the Bundaberg area as we progress into the first decade of this new century. Hepatitis A is a preventable disease and as such, it makes good sense to raise awareness of its changing epidemiology and to target those persons at greatest risk of hepatitis A virus infection.

1.1 Purpose of the Study

The purpose of the present study was to evaluate the self-reported hepatitis A immunisation amongst child care workers in long day care centres in the Bundaberg region. Other research questions to be examined at these workplaces included the levels of awareness by workers of the NHMRC recommendations for hepatitis immunisation of child care workers, undertake comparisons between self-reported hepatitis A immunisation levels in the centres and self-reported hepatitis B immunisation levels amongst the same work group and to ascertain if changes in training and educational initiatives are needed to achieve improvements in those levels of immunisation.

The identification for other factors such as knowledge of immunisation policy requirements, records keeping, attitudes and beliefs by centre management, and risk perception by child care workers that may affect reported immunisation awareness levels were also part of the study's evaluation. It was anticipated that a survey of child care workers in

Bundaberg regional long day care centres, would reveal minimal hepatitis A immunisation levels in comparison with hepatitis B immunisation. Secondly, that worker risk perception would be higher for hepatitis B infection than hepatitis A infection in the child care setting.

The researcher envisaged that knowledge about current self-reported hepatitis A immunisation of workers in child care settings and other associated issues would provide recommendations for changes that will ultimately lead to improving those immunisation rates. The researcher also believed that these findings would confirm the need for enhanced training initiatives on immunisation issues for employees in Bundaberg child care centres. It was further anticipated that this current research would corroborate similar findings of a major Victorian study of hepatitis A in child care centres previously conducted by Thomson, Kennedy and Thompson in 1996 (Thomson et al. 1998). Bennett (1990) has suggested that studies need to be replicated either in whole or part, in order to give depth and substance in an area, as well as increase confidence in the findings. On the other hand, Battegay et al. (1995) also proffer the view that the epidemiology of hepatitis A in many parts of the world is changing rapidly, so that data obtained in the past may not be valid today. It was the outcomes of this earlier Australian study which influenced the focus of this present research.

1.2 Statement of the Hypothesis

It was hypothesised that;

(a) there had been poor uptake of hepatitis A vaccinations in accordance with the NHMRC recommendations by child workers in Bundaberg regional long day care centres; and

(b) there is a need for increased efforts by authorities and stakeholders in

the child care industry in relation to education, training and policy programs for child care worker immunisation against hepatitis A infection.

1.3 Definitions

The list of terms and phrases utilised in the current study are defined from the literature as follows:

(i) *antibodies* - antibodies are manufactured in the body specifically to deal with the antigens associated with different diseases as they are encountered; they are secreted by plasma cells in response to an antigen and are capable of binding specifically with that antigen;

(ii) *antigen* - any substance that the body regards as foreign or potentially dangerous and against which it produces an antibody; usually proteins, they activate the acquired immune system and induce an immune response;

(iii) *asymptomatic* - not showing any symptoms of disease, whether disease is present or not;

(iv) *bacteria* – micro-organisms that are smaller than a blood cell but bigger than a virus; they lack distinct nuclear membrane, considered more primitive than animal or plant cells, are unicellular and generally range in size between 0.5 and 5μm; very widely distributed, some live in soil, water, air, others are parasites of man, animals and plants;

(v) *carrier* - a person who harbours the micro-organisms causing particular disease without experiencing signs or symptoms of infection and who can transmit the disease to others;

(vi) *clinical* - dealing with (the study of) actual patients and the observation, diagnosis and treatment of disease at the bedside; as opposed to theoretical research;

(vii) *communicable disease* - a disease which is transmitted from one host to another;

(viii) *disease* - a harmful alteration to the physiological or metabolic state of a host; a disorder with a specific cause and recognisable signs and symptoms;

(ix) *endemic* - occurring frequently in a particular region or population; applies to diseases that are generally or constantly found among people in a particular area; they spread at a low but constant rate;

(x) *epidemiology* - the study of the occurrence, spread and control of disease, with a view to finding means of control and future prevention, and includes all forms of disease that relate to the environment and ways of life;

(xi) *family day care centre* - home based service in which women are paid to provide child care in their (the carer's) own home and supported by regular visits from trained staff; caring for children from birth to primary school age. A sponsoring agency, usually a local council, church group or other community organisation takes responsibility for recruiting caregivers and matching them with families seeking child care;

(xii) *immunisation* - the exposure of a person to material or foreign substance that activates the acquired immune system to make them immune to certain micro-organisms by inducing an immune response;

(xiii) *immune* - protected against a particular infection by the presence of specific antibodies against the organisms concerned;

(xiv) *immunity* - the body's ability to resist infection afforded by the presence of circulating antibodies and white blood cells;

(xv) *infection* - the invasion and growth of any living organism by disease causing micro-organisms which proceed to establish themselves, multiply, and produce various symptoms in the body of the host;

(xvi) *infectious disease* - a disease which is caused by a pathogenic micro-organism or its products; can be transmitted from one person to another by direct contact, by common handling of an object that has picked up infective micro-organisms, through a disease carrier or by infected droplets coughed or exhaled into the air; the most dangerous are on the list of notifiable diseases;

(xvii) *long day care (LDC) centres* - facilities open for a minimum of eight hours per day and usually operate fifty weeks of the year; non-profit services can be either managed by parent or community committees and usually referred to as community based centre, or employer sponsored centres with less likelihood of a parent or community committee; accept children from birth to school age with some after school care for primary school children. Profit making centres are referred to as commercial with services run as a private, profit making business. LDC centres are intended primarily for children where parents are in paid employment or who are studying or training; they utilise a purpose built facility;

(xviii) *notifiable disease* – a communicable disease more dangerous than others, with a high level of risk to public health, for which a national notification and reporting system has been established for all Australian health authorities; the data collected is analysed on the basis of age, sex, geographical distribution and seasonal variation, and published via fortnightly bulletins;

(xix) *pathogen* - any disease causing micro-organism, for example virus and bacteria; pathogens may invade via a wound, through the mucous membranes lining the alimentary, respiratory and reproductive tracts, and may be transmitted by an infected individual , a carrier (for example, animal or insect) or plant;

(xx) *sub-clinical* - describing a disease that is suspected but is not sufficiently developed to produce definite signs and symptoms in the patient;

(xxi) *vaccination* - the means of producing immunity to a disease by using a vaccine or special preparation to stimulate the formation of appropriate antibodies; now used synomously with innoculation as a method of immunisation against any disease; carried out over two or more stages as separate doses are less likely to cause unpleasant side effects; usually given by injection but can be given orally;

(xxii) *vaccine* - a special preparation containing one or more antigens (substance that induces an immune response) that is used to immunise a person against a specific disease by conferring active immunity; and

(xxiii) *virus* - a minute, living, infectious particle smaller than a bacterium consisting of nucleic acid and a protein coat; capable of replication but only in living cells, they cause infections such as measles, influenza and hepatitis A and B.

1.4 Limitations

The following limitations may apply to this study:

1. The purposive sampling procedure will decrease the generalisability of the study's findings; the findings will be applicable only to workers in

long day care centres and will not generalise to other areas of child care;

2. The levels of immunisation were self-reported by workers. No other checks to confirm the immunisation status of workers were undertaken by the researcher;

3. Management of one centre elected, after survey distribution, not to allow its workers including the director to participate in the study; and

4. Not all questions in both survey documents were answered by all respondents.

1.5 Delimitations:

The following delimitations may narrow the scope of the study:

1. The size of the sample group for centre directors was small (n = 14);

2. This study confined itself to self-reported, survey questionnaires, one for workers and another for directors at long day care centres in the Bundaberg region;

3. There were no interviews or observations of workers conducted; and

4. One centre operating as family day care, was categorised as long day care for the study owing to its hours of operation, it was the only type of centre (purpose built) in the township, it was not home based in the true sense of family day care and the numbers and age range of young children in care.

CHAPTER 2

REVIEW OF THE RELEVANT LITERATURE

Outbreaks of hepatitis A among children in day care centres, and parents and staff members who care for them have been well documented. Hepatitis A remains an important source of community health outbreaks (Amin et al. 1999; Balcarek et al. 1995; CPHUN 1998a; Davison et al. 1996; Desenclos & MacLafferty 1993; Ferson et al. 1994; Hadler, Webster, Erben, Swanson & Maynard 1980; Hadler, Erben, Matthews, Starko, Francis & Maynard 1983; Hadler & McFarland 1986; Hanna 1993; Heath et al. 1997; Hurwitz, Deseda, Shapiro, Nalin, Freitg-Koontz & Hayashi 1994; Staes, Schlenker, Risk, Cannon, Harris, Pavia, Shapiro & Bell 2000; Tallis et al. 1996; Thompson & Kennedy 1998; Thomson et al. 1998). Child care workers who change the nappies of infants are likely to be four to five times more at risk of hepatitis A infection than child care workers who do not change nappies (Hadler & McFarland 1986; Mullin & Stehr-Green 1991).

The purpose of this literature review is to examine the current state of knowledge as it relates to hepatitis A in child care centres with particular emphasis on the effects to child care workers and children. Furthermore, the review will discuss the importance of immunisation of staff and infants, and hygienic measures as effective strategies to control outbreaks of the disease in child care settings. This discussion will present evidence to support the concept that there is a need for increased efforts by authorities to educate and train child care workers in the importance of immunisation against hepatitis A infection.

2.1 Hepatitis A - Epidemiology

Hepatitis A virus (HAV) infection represents a significant cause of morbidity in many parts of the world (Gust 1992b; Melnick 1995; Mutton & Gust 1984). In fact, in some developing countries, Jackson and Rymer (1994) advise that virtually the whole population has been exposed. HAV is a small RNA virus belonging to the family of *picornaviruses* (Battegay, Gust & Feinstone 1995; Black 1996; Lee & Bishop 1997) and one of the viruses that causes damage to the liver (Crowley 1997; Mutton & Gust 1984). The NHMRC and others advise that it is transmitted through contaminated food and water, and through direct person to person contact via the faecal-oral route (Jackson & Rymer 1994; Lee & Bishop 1997; NHMRC 1997; Shaw 1999; SmithKline Beecham 1993; Stapelton 1999; Tabor 1984). This primary mode of transmission of the virus is in contrast to the parenteral or blood-borne spread of hepatitis B and C. Research from the United States of America (USA) suggests that blood and saliva are not thought to play a significant role in the transmission of hepatitis A (Hadler & McFarland 1986).

Hepatitis A has been reported as being endemic in areas of the world where there is overcrowding and poor standards of sanitation and hygiene including many countries in Asia, Africa, and South America (Battegay et al. 1995; Gurevich 1993; Gust 1992b; Papaevangelou 1984; Shaw 1999; SmithKline Beecham 1993). Studies in Western countries, such as USA, have also shown that up to fifty percent (50%) of adults already possess hepatitis A antibodies (that is sero-positive) indicative of previous infection (Hadler & McFarland 1986). Jackson and Rymer (1994) report that antibodies to HAV have been found in up to 60% of adults over the age of 50 years in developed countries. They go on to state that it is so common in some developing countries, because the whole population has been exposed due to poor sanitation and contaminated water. Koff's (1995) review found almost 40% of individuals in the United States were sero-positive for prior HAV infection and that rates increase

with age, perhaps reflecting an aging cohort of persons that had been infected in earlier times when the infection was more common.

2.1.1 Morbidity Data - An Inconsistent Picture

In a recent review of the epidemiology and controls of hepatitis A, Shaw (1999) observed that incidence rates for entire countries or provinces do not reflect the true heterogeneity of the disease. He concluded that in every country the asymptomatic nature of the infection causes hepatitis A to be under reported. Earlier research by Mutton and Gust (1984) confirmed that the actual prevalence of hepatitis A is difficult for health authorities to evaluate because of under-reporting, failure to distinguish from other forms of hepatitis and failure to detect asymptomatic infections. Gust's (1992b) review also found known annual incidences of hepatitis A varied tremendously between countries, from three cases per 100,000 population in Sweden to 250 cases per 100,000 in Thailand. He goes on to state that there still exists major defects in the quality of data even though hepatitis A (jaundice) has been a notifiable disease for 50 years. For example, the completeness of reporting in some countries, the reliability of the actual diagnosis where laboratories are lacking and in many countries, analysis of morbidity data collected has often reflected seasonal and cyclical peaks.

Alter, Mares, Hadler and Maynard (1987) have suggested that inconsistencies between active surveillance and passive reporting of cases of both hepatitis A and B may not accurately reflect the magnitude of the risk for specific populations. Their study focused upon persons in Pierce County, Washington (USA) who had been diagnosed by physicians in the period March 1 to August 31, 1984. Active surveillance covers primary sources of medical care including all private physicians, while passive reporting includes secondary sources of non-direct medical care. Their analysis of active surveillance showed that passive reporting was only about 65% complete in that County and subsequently drew the attention of public health

authorities to their findings. Further, Herceg, Oliver, Myint, Andrews, Curran, and Crerar et al. [sic] (1996) also suggest that notifications in Australia of infectious diseases such as hepatitis A generally represent only a proportion of actual cases due to under reporting.

On the other hand, Thomson, Lin, Halliday, Preston, McIntyre, Gidding, Amin, Roberts, Higgins, Brooke, Milton, O'Brien, Witteveen and Crerar (1999) report that incomplete trends in the notification of data through the National Notifiable Diseases Surveillance System (NNDSS) also contributes to the underestimate of the actual incidence of disease in Australia. Closer to home, the CPHUN (1999) reported what they termed 'black holes' in the local Wide Bay notifications due to transport handling errors, despatch to wrong laboratory destinations, incompatible laboratory databases and delays between receipt of specimens and post-confirmation notification onto databases. Gust (1992b) proffers that the true incidence of hepatitis in most countries may probably be four to five times higher than is currently reported. In Australia, hepatitis A is notifiable by doctors and laboratories in all States and Territories to the NNDSS (Amin et al. 1999).

2.1.2 Clinical Features of Hepatitis A

The incubation period of hepatitis A ranges from 15 to 45 days (average 28 days) with faecal excretion of the virus occurring a week before and after the onset of jaundice (Gurevich 1993; NHMRC 1994, 1997; Smales 1998; SmithKline Beecham 1993; Stapelton 1999). Typical symptoms include jaundice (yellowing of the skin and whites of the eyes due to impaired liver function), nausea, fever and abdominal pain, although children tend to have more gastrointestinal illness such as diarrhoea (Battegay et al. 1995; Benenson 1990; Jensen et al 1997; Lee & Bishop 1997; Mitchell 1990). Occasionally, patients will develop joint pain or a skin rash. Apart from jaundice, other common signs are the urine turning brown and pale coloured faeces.

The virus is secreted via the bile into the intestine (SmithKline Beecham 1997; Stapelton 1999). Most evidence indicates that the virus first multiplies in the intestinal epithelium (Jensen et al. 1997). Faecal shedding of the virus may continue for prolonged periods, for example six months in asymptomatic neonates (Lee & Bishop 1997; Specter 1999).

The majority of people completely recover from hepatitis A within two months, although for some adults the disease may be a persistent, severe illness lasting six months. Non-immune adults however, face the prospect of a prolonged and debilitating illness following HAV infection and for this reason represent a primary target for vaccination (Koff 1998; SmithKline Beecham 1993). The sole natural reservoir of HAV is in the human species (Battegay et al. 1995; Benenson 1990; Koff 1998; Shaw 1999) and like many other diseases, would no longer exist if all human beings were immune.

2.2 Hepatitis B - Epidemiology

Hepatitis B (formerly called serum hepatitis) in contrast to hepatitis A, is caused by a member of the family *hepadnaviridae* which includes various closely related viruses that infect birds and mammals (Black 1996; Crowely 1997; Jensen et al. 1997; Vyas & Yen 1999). The hepatitis B virus (HBV) has worldwide distribution with more than 300 million carriers throughout the world and approximately one million deaths each year (Lee & Bishop 1997; Smales 1998). Zucherman and Lavanchy (1999) suggest that there are over two billion people alive today who have been infected with the hepatitis B virus. They also estimate that more than 75% of the chronically infected carriers are from South East Asia and the Western Pacific region. Although not all carriers are infectious, they represent an important reservoir of infection and for that matter are a significant public health challenge. The disease is responsible for much morbidity, mortality, economic loss and human suffering (Benenson 1990; Lee & Bishop 1997; NHMRC 2000; Vyas & Yen 1999).

In their major review of HBV, Vyas and Yen (1999) found three significant points for deliberation. Firstly, that there were more than 200,000 new infections every year in the USA, secondly that HBV continues to be a major health problem and thirdly, that HBV is under-appreciated in that country. In addition, Jensen et al. (1997) estimate that 1.25 million persons in the USA have chronic HBV infection and are potentially infectious to others. Worksafe Australia (National Occupational Health and Safety Commission [NOHSC] 1993) also state that infection with the HBV is a significant Australian public health issue. In Europe, North America and Australia, the VHPB (1994) advise that most infections occur in adult 'high risk groups' defined by occupation or lifestyle. Occupational transmission of the HBV is not a major cause of hepatitis B infection. However, some people in particular occupations are at risk of hepatitis B infection because of the nature of their work. These groups, for whom the NHMRC and VHPB recommend vaccination as a risk minimisation strategy, include health care workers, laboratory workers, police officers, prison officers, emergency workers and child care centre staff (NHMRC 1997, 2000; VHPB 1994). Both the NHMRC and VHPB (1994) further advise that while the risk of infection differs from setting to setting workers involved with patient care or in the handling of human blood, body fluids or tissue in any form should be vaccinated.

2.2.1 Clinical Features of Hepatitis B

Hepatitis B has a much longer incubation period than hepatitis A at six weeks to four months, (Black 1996; Crowley 1997; Jensen et al. 1997; NHMRC 2000; Vyas & Yen 1999). The period of communicability extends from several weeks before the onset of the illness to the end of the acute phase. Once infected, the virus invades an individual's liver and the HBV multiplies within the liver cells; the human body then tries to get rid of the hepatitis B by killing the infected cells (Crowley 1997; Vyas & Yen 1999). It is this self defence or immune mechanism that ironically causes

most damage to the liver. In young children, especially those under one year of age, infection is usually asymptomatic. In 50% of adults, the NHMRC (2000) report that the infection causes symptomatic acute hepatitis. The acute illness can be indistinguishable from other forms of hepatitis, with similar symptoms including fever, jaundice, malaise, anorexia, nausea, vomiting, abdominal pain, myalgia, anthralgia, skin rashes, arthritis and passage of dark urine and light coloured stools (Jensen et al. 1997; NHMRC 2000; Vyas & Yen 1999).

2.2.2 Hepatitis B - Transmission in the Workplace

Worksafe Australia (NOHSC 1993) report there is no evidence that HBV is spread by insects, food, water, sneezing, coughing, toilets, urine, swimming pools, sweat, tears, casual contact, shared eating and drinking utensils or other items such as protective clothing or telephones. However, the blood and body fluids of people in the acute phase of infection, and that of carriers, contain the virus. Disease transmission to another person only occurs if this infectious material enters the body through the skin or less commonly, comes into contact with mucous membranes such as the inside of the mouth or surface of the eyes (Benenson 1990; NOHSC 1993; VHPB 1994). Moreover, the virus can survive for days in dried blood contaminating the surface of an object and has been infrequently found in saliva, urine and faeces in lower concentrations (Jensen et al. 1997; Lee & Bishop 1997; Vyas & Yen 1999). For example, Crowley (1997) warns that contaminated dental instruments or instruments used for ear piercing may transmit HBV. Several authors also report that drug abusers may transmit the virus by sharing needles and other injecting equipment (Benenson 1990; Crowley 1997; Jensen et al. 1997; NHMRC 1997, 2000).

In the workplace, Worksafe Australia (NOHSC 1993) advise that disease transmission means, for all practical purposes, accidents where the skin is punctured or infected material is splashed into the eyes, mouth or onto open wounds. In addition to these recommendations, the NHMRC (1997, 2000) also advise that while

staff at child care centres are normally at minimal risk of hepatitis B, child to child (horizontal) transmission usually occurs through contact between open sores or wounds. While on the one hand, Crowley (1997) and VHPB (1994) advise that HBV is rarely, if ever transmitted via body substances such as urine and faeces, Lee & Bishop (1997) caution by stating that it is nevertheless important to recognise them as potential sources of infection in such workplaces.

Studies have shown that the transmission of HBV in day care settings does occur even if infrequent (Desada, Shapiro, Carroll & Hinds 1994; McIntosh, Bek, Cardona, Goldston, Isaacs, Burgess & Cossart 1997). For example, McIntosh et al. (1997) reported the case of a 19 month old boy in central Sydney who contracted acute HBV after attending a day care centre for 13 months. They subsequently identified by molecular fingerprinting that he had been infected by a 22 month old child who was a known carrier of hepatitis B e antigen (HBeAg). This child had attended the day care centre for only six months. McIntosh et al. (1997) observed that this carrier had dermatitis, profuse blood-stained saliva and a history of biting. As part of this study, they surveyed both the staff and parents of the 90 children at the centre and collected blood samples from all attending children. An accelerated vaccination schedule was then commenced. The most likely modes of transmission as determined by McIntosh et al. (1997) were a bite, blood-stained saliva or direct contact with skin exudate (that is, the slow escape of liquid) as a result of inflammation. McIntosh et al. (1997) further suggested that conclusive evidence of HBV transmission in day care centres was infrequent, but did state that it was not negligible. While the exclusion of known carriers is one prevention measure available to centre management, the study by McIntosh and colleagues recommended universal immunisation as a minimum.

Research suggests that the preventive approach to hepatitis B infection in workplaces should be based on the universal application of work practices which prevent the introduction of other people's blood, body fluids and tissue into the

human body (Lee & Bishop 1997; NOHSC 1993; VHPB 1994). If they are at risk, they should be vaccinated. The NHMRC (1997, 2000) also recommends that where risk of transmission exists, even if low, vaccination should not be discouraged as a vital strategy to prevent occupational transmission in such settings. Today, universal vaccination is recommended and HBV vaccination is included in vaccination schedules recommended for newborn infants (Crowley 1997; NHMRC 2000). The universal program for HBV commenced in Australia in 1996.

2.3 Employer's Duty to Vaccinate

Every employer who is liable to expose any of his or her workers to any significant risk to their health and safety must keep fully informed of such risks and just what preventative measures are available. The Division of Workplace Health and Safety (DWHS) advises that these obligations are contained within Part 3 of the Workplace Health and Safety Act (Queensland) 1995 (DWHS 1995). Howard (1996) makes the point that there would be no excuse for or defence of ignorance of the risks to health of HAV or HBV where workers are exposed to such viruses. Employers must therefore keep in mind, in relation to cross infection through work, common law duties not to act in a negligent manner, including duty to guard against reasonably foreseeable risks to health and safety. Similarly, employers also have statutory duties such as risk assessments, taking control measures, informing staff about risks to health and safety, identifying those who may be particularly vulnerable, risk reduction by operating safe systems of work, immunising high risk workers and adopting post exposure prophylaxis under current legislation. The employer must balance the risks and decide what the significant and substantial risks to employee health and safety are. Therefore, in an occupation where there is a risk of infection due to patient contact, child contact or contact with contaminated products such as fomites (for example, blood, human waste or bodily fluids), a concerned employer will seek to vaccinate those particular staff at risk.

Moreover, it is generally recognised that the most stringent prevention policy advocating best practice in business is only as good as the level of compliance amongst the workforce. Mindfully then, both the NHMRC (1997, 2000) in Australia and the VHPB (1994) in Europe advise that it is important for all prevention programmes implemented by employers to be continually monitored and evaluated for effectiveness.

2.4 Main Routes of Infection for Hepatitis A

Several authors have identified that the HAV is readily transmitted from a reservoir (in this case, the human body) to a susceptible host by a number of routes of infection (Battegay et al. 1995; Bitton 1994; Koff 1995; Mutton & Gust 1984; NHMRC 1997, 2000; Papaevangelou 1984; Stapelton 1999). These identified routes are: person to person, food-borne, water-borne and fomites. However, a variety of routes of transmission is also thought responsible for HAV infection in travellers or as it is sometimes known 'traveller's hepatitis' (Mutton & Gust 1984; NHMRC 2000). For travellers to countries where HAV is endemic the route of transmission can be a combination of all three. Risks can be high, with the disease affecting business travellers, backpackers, diplomats, expatriates, aid workers and missionaries (NHMRC 2000). Although there is some evidence for airborne dissemination of HAV under certain conditions as a possible fifth route of infection, both Bitton (1994) and Mutton and Gust (1984) are of the view that this means of disease transmission cannot be sufficently determined without further investigations.

2.4.1 Person to Person Transmission

Person to person transmission is the most common form of HAV infection and is via the faecal-oral route. It is limited to close contacts. Battegay et al. (1995) state that young children are frequently involved in the spread of infection in places such as households, day-care centres and schools. Infections in this group are often

silent because of the long incubation period of the disease (Papaevangelou 1984) and because standards of hygiene are lower in children than among adults. Person to person spread accounts for most infections in developed countries.

A number of authorities have identified patterns in particular groups or gatherings of people who are more prone to person to person spread of HAV (Battegay et al. 1995; Benenson 1990; Koff 1995; NHMRC 1997, 2000; Mutton & Gust 1984; Shaw 1999; Van Damme, Mather, Thoelen, Meheus, Safary & Andres 1994; VHPB 1995). Because of the intense transmission amongst such groups, the NHMRC (2000) report that these settings serve as potential sources for transmission to the broader community. Some of these identified settings include day care centres, schools including pre-schools, communities of men who have sex with men, hospitals, communities of injecting drug users and facilities for the intellectually disabled (NHMRC 2000). Mutton and Gust (1984) advise that poverty, overcrowding, ignorance and inadequate health and sanitation facilities also provide the prime circumstances under which hepatitis A flourishes in person to person transmissions. The NHMRC (2000) further report that in Australia, community outbreaks tend to affect low socioeconomic areas where young children play a substantial role in their propagation because of such issues as their lack of control of their bowel motions and lack of attention to good personal hygiene.

Household spread of hepatitis A by person to person contact is also another important mode of transmission in communities (Desenclos & MacLafferty 1993; Mutton & Gust 1984; Staes et al. 2000; Stapelton 1999). In a case controlled epidemiological study of hepatitis A transmission during a 13 month long (1988-9) community wide outbreak in Florida, Desenclos and MacLafferty (1993) found that 37% of cases were linked to day care centres, independent of the city of residence. This study observed that most of the 311 hepatitis A cases were residents of either a large metropolitan area or two smaller cities. The attack rates (AR) were greater for males than females and for residents aged 25 - 35 years (AR = 9.7 per 10,000

population) and less than five years (AR = 8.3 per 10,000 population). Another major finding showed an increased risk of hepatitis A in households in which a child attended a day care centre (p = 0.02) and centres that could take more than 50 children had an increased risk of hepatitis A introduction than smaller ones (p = 0.05). The authors concluded that the risk of hepatitis A introduction into households with children in nappies and with children attending day care centres was up to nine times that of the general population. This example suggests day care centres were an important source of hepatitis A spread in the community and that there is a need for timely surveillance and emphasis on vaccination by routine administration of normal immunoglobulin (human) [NIGH]. {Immunoglobulin [Ig] is one of a group of proteins (globulin) that acts as an antibody and are produced by specialised white blood cells and are present in blood serum and other body fluids; there are several classes of Ig, each with different functions – IgA, IgD, IgE, IgG and IgM; *Concise Medical Dictionary*, 1994.}

In a more recent 1996 study, Staes et al. (2000) reported that during a community wide outbreak, HAV infection among children was common, was frequently unrecognised and may have been a major contributory factor to transmission within and between households. Salt Lake County, Utah was the setting for this serologic and descriptive survey of 355 household contacts of 170 persons reported with hepatitis A during May to December 1996. There was no identified source of infection. Staes and colleagues (2000) also surveyed 730 food handlers working in establishments where the case patients had eaten. Overall, 70 households contacts (20%) were immunoglobulin M (IgM) anti-HAV positive, including 52% of children three to five years old and 30% of children less than three years old. Using multivariate analysis, the presence of a child less than three years old (odds ratio [OR]: 8.8; 95% confidence interval [CI]: 2.1,36) and a delay of 14 or more days between illness onset and reporting (OR: 7.9; 95% CI: 1.7, 38) were associated with household transmission. Of 18 clusters of infections linked by transmission between households, 13 (72%) involved unrecognised infection among

children less than six years old. The highest proportion of infection (that is IgM anti-HAV positive) occurred among children three to five years old (52%), followed by children less than three years old (30%) and six to 14 years old (24%) [n = 355].

The findings from this study indicated that person to person transmission, both within and between households, occurred frequently, often involving young children with unrecognised HAV infection. This conclusion is consistent with an earlier study by Hadler and McFarland (1986) implicating children in nappies as the most important vectors of HAV transmission in child care centres. However, Staes et al. (2000) did not find evidence that attendance in child care increased the risk of acquiring HAV infection. Moreover, they did demonstrate that without serological testing of actual households contacts, risk factor information derived from the surveillance data may in fact overestimate the importance of exposure to child care settings. It may also underestimate the importance of infected household contacts as a source of hepatitis A infection. Staes et al. (2000) acknowledge the study's limitations in that serological testing was only performed on 75% of eligible households contacts, meaning that the serological status of the untested persons may have further influenced the investigation results. Moreover, they were unable to determine who transmitted to whom within a number of households. Nevertheless, they did document whether transmission occurred in the majority of participating households without selectively excluding households with young children. Transmission from 83 surveyed commercial food establishments employing approximately 4000 food handlers was uncommon. None of the tested food handlers were IgM anti-HAV positive.

2.4.2 Food-borne Transmission

HAV is also transmitted by food contaminated with faeces from an infected person or by ingestion of HAV in raw shellfish. Infected food handlers responsible for food preparation can unknowingly contaminate foods prepared before the food

handler has the clinical symptoms. Mutton and Gust (1984) advise that food handlers with poor personal hygiene are more likely to transmit infection than those with higher standards. They go on to state that colleagues working with an infected food handler are at moderate risk of contracting HAV, because they often eat together while at work. Battegay et al. (1995) found that most outbreaks could be traced to food handlers who failed to observe hand washing procedures after defecation. Shellfish (bivalve molluscs such as oysters, clams and mussels) have also been associated with HAV infection as they are commonly eaten raw or after only gentle cooking or steaming (Benenson 1990; Mutton & Gust 1984; NHMRC 2000; Rippey 1994; Stapelton 1999). Non-bivalve shellfish such as prawns (shrimp) and lobster do not impart the same risk (Stapelton 1999).

Research by Rippey (1994) concluded that HAV in shellfish is caused by bacterial agents native to the marine environment and by viral and bacterial agents from sewage effluents and other sources that contaminate environmental waters. Food vehicles involved with previous HAV outbreaks include milk, orange juice, salads and salad vegetables, hamburgers, garnished sandwiches, spaghetti, cream, pastries, pasta, strawberries and lettuce (Battegay et al. 1995; Benenson 1990; Mutton & Gust 1984). Bitton (1994) suggests that food-borne transmission is more important than water-borne transmission as a mode of transport of the infectious agent (in this case, HAV) from the reservoir to the host. The VHPB (1995) assert that food handlers are important not because they are a high risk group for infection, but because they can transmit and amplify infection in the community.

2.4.3 Water-borne Transmission

While water-borne outbreaks are infrequent (Mutton & Gust 1984), they have the potential of spreading HAV to large populations of susceptible people. They are associated with both private and public municipal water supplies, with the common factor being contamination of the water with human faeces. In the USA, water-borne

disease outbreaks have been reported to the U.S. Environmental Protection Agency since the 1920's. Bitton's (1994) analysis cited 23 outbreaks of hepatitis A resulting in 737 cases of illness during the period 1971 to 1985. These all arose from water-borne outbreaks from groundwater and surface water systems. Battegay et al. (1995) report that it is possible to acquire HAV by swimming in contaminated water, but caution by stating that data on the level of risk is currently limited. However, Bitton (1994) questions this possibility by advising that swimming in recreational waters has not been associated with HAV infection.

In October 1997, Australia's first known case of hepatitis A infection being spread in a domestic spa was reported in Melbourne (Tallis & Gregory 1997). In this outbreak, seven boys aged between eight and 15 years including the earlier notified and serologically confirmed case, used the spa pool after a football presentation night. Whilst in the pool, 'whale spitting' was performed, in which mouthfuls of spa water were spat in a projectile fashion. Other modes of transmission such as sharing of food and drink could not be excluded by the researchers. Cases were found to be more likely than non-cases to have swum in the spa pool rather than a swimming pool, swam for more than one hour and to have put their heads under the water. The Victorian Infectious Diseases Unit concluded that recreational pools may serve as a mode of transmission for HAV, particularly in children (Tallis & Gregory 1997). In this particular situation, the behaviour of the boys by 'whale spitting' is likely to have contributed to the spread of the disease, resulting in unintentional ingestion of contaminated water. Contaminated water can be rendered safe by addition of appropriate levels of chlorine or by boiling. Battegay and colleagues however, postulate that transmission by droplet infection is theoretically possible, but as yet is not fully proven (Battegay et al. 1995). On the other hand, Bitton (1994) states that four per cent (4%) of hepatitis cases observed in the USA between 1975 and 1979 were the result of water-borne transmission. He cites that these cases were due to consumption of improperly treated water.

2.4.4 Fomites

Some pathogens such as HAV can be transmitted by non-living objects or fomites. Any non-living object involved in the spread of an infection is called a fomite; often referred to as indirect contact transmission (Tortora et al. 1986). Fomites are described as any object that is used or handled by a person with a communicable disease and may therefore become contaminated with the infective organisms and transmit the disease to a subsequent user. Common fomites include such things as clothes, utensils, toys, towels, bed clothes, handkerchiefs, cups, money, thermometers and nappies (Bitton 1994; Tortora et al. 1986). Ferson (1997) advises that contaminated fomites, surfaces, toys and utensils in the child care environment may also be vehicles for the spread of infection. He advocates the vigorous physical cleaning of toys and surfaces on a daily basis, using water and a neutral detergent to remove pathogens from contaminated articles. His previous research found that the prevalence of faecal coliforms on hands, surfaces and in air samples was inversely related to the age of the children. Petersen and Bressler (1986) reported in their earlier research that the likelihood of faecal contamination was greatest on the hands of infants and carers, and least on those of the older children. Other investigators have observed that disposable nappies appear to be superior to cloth nappies in preventing faecal contamination of the environment (Van, Wun, Morrow & Pickering 1991). Ferson (1997) though has some reservations stating that it is still not clear whether disposable nappies actually reduce the incidence of diarrhoeal illness in children.

2.5 Workplace Risk Factors

Occupationally acquired hepatitis A can be encountered in the workplace by certain groups of people (NHMRC 1997, 2000). These groups work with contaminated material such as faeces, human blood, body fluids and tissues or waste matter containing this material. Workers can also be brought in contact with

equipment, products or items such as fomites contaminated by these materials or infective organisms. The intensifying effect of person to person transmission amongst these particular work groups serves as potential source of transmission to the broader community (NHMRC 2000). The degree of risk to people in a workplace correlates with the frequency and extent of exposure to contaminated material during the course of such occupational activities (Benenson 1990; Lee & Bishop 1997; Tortora et al. 1986). In the workplace, previous research suggests that hepatitis A is a preventable disease which can be controlled by careful attention to personal hygiene and effectively managed through use of risk assessment and risk control (Gurevich 1993; Mitchell 1990; NHMRC 1997; Van Damme 1996). Moreover, Stapleton (1999) and others are not only advocates for adherance to hygienic precautions such as strict handwashing procedures but also report that immunisation is a key component of any prevention and management of hepatitis A infection (Battegay et al. 1995; Lee 1994; Lee & Bishop 1997; Stapleton 1999).

Lee and Bishop and others state that HAV spread is primarily due to poor personal hygiene (Ferson 1997; Gust 1992b; Lee & Bishop 1997; Van Damme 1996). These researchers suggest that failure to wear gloves when contact with faeces occurs or to wash hands thoroughly before eating are major factors in outbreaks in institutional settings such as pediatric wards and day care centres. Researchers have also found that hepatitis A has been known to survive on the hands for many hours (Mbithi, Springthorpe, Boulet & Sattar 1992). Hand washing, using soap and warm running water, is seen as the principal means of reducing transmission and contamination. Other researchers state that gloves should be worn when handling any material potentially contaminated with faeces (Bitton 1994; Battegay et al. 1995; Shakespeare & Poole 1993b). They emphasise frequent handwashing whether gloves are worn or not.

In addition, the NHMRC and others have also identified that individuals can get hepatitis A by swallowing or ingesting contaminated water or ice and eating raw

shellfish harvested from sewage contaminated water (Gust 1992b; NHMRC 1997; Mutton & Gust 1984). For example, in Australia, in February 1997, the print media reported that the ingestion of sewage contaminated oysters from Wallis Lake, New South Wales, had contributed to the death of a 77 year old man (Nason 1997). In excess of 150 reported cases of hepatitis A infection and subsequent illness in New South Wales and Victoria were also notified to authorities from this outbreak.

Previous research in Israel has also identified which particular occupations were actually at significant levels of risk of infection from HAV. In this investigation, Lerman, Chodik, Aloni, Ribak and Ashenazi (1999) undertook a two year prospective study of different occupations in Israel during 1993 and 1994. Their investigation showed certain occupations were at significant risk of HAV after controlling for age, gender, ethnicity and time of immigration to Israel: yeshiva students (standardised incidence ratio {SIR} = 9.98, 99% confidence interval: 7.55, 13.18), day care centre and kindergarten staff (SIR = 5.47, 99% confidence interval: 3.50, 8.57), food industry workers (SIR = 5.41, 99% confidence interval: 1.92, 15.25), teachers (SIR = 4.02, 99% confidence interval: 2.92, 5.48), physicians and dentists (SIR = 3.77, 99% confidence interval: 1.78, 8.14), and therapists and medical technicians (SIR = 3.75, 99% confidence interval: 1.75, 8.14). Their results were validated by comparison with an additional standard population. Interestingly, they found that sewage workers and nurses were not at any significantly increased risk. This study provided real quantitative data verifying which 'at risk' occupational groups should receive active vaccination. Lerman and colleagues demonstrated a benchmark for measuring samples in both large and small countries that have a socioeconomic background similar to that of Israel (Lerman et al. 1999).

In addition, Ferson (1997) advises that in close knit, heavily populated and staffed workplaces such as child care settings, the risk of transmission of HAV and other diseases is increased when children or adults are gathered into such groups for any reason. Aronson (1991) also states that this was particularly the case with

children and toddlers who are not toilet trained. The need for adult supervision of their toileting needs contributes to increased risk of exposure and places additional responsibilities on these workers. Previous research by Ferson (1993) revealed that the spread of infections in child care centres is facilitated by two key factors, namely crowding and microbial contamination. In addition, the unhygienic behaviours and greater susceptibility of young children were also observed as crucial determinants in the spread of HAV. A study by Wald, Dashefsky, Byers, Guerra and Taylor (1988) also reported that children in attendance at child care centres had 51% more episodes of infections and spent 134 more days in illness than children cared for at home. Ferson (1997) later reported that children attending child care centres do experience greater illness than do children cared for at home. A number of earlier studies confirm child care workers and other adult contacts are at increased risk of a number of infections including hepatitis A, upper respiratory tract infection and gastroenteritis (Ferson 1997; Hardy & Fowler 1989; Louhiala, Jaakkola, Ruotsalainen & Jaakkola 1995; Woodward, Douglas, Graham & Miles 1991). All of these foregoing reports suggest that the presence of children in day care workplaces increases the risk of illness among staff and family members and promote the circulation of infections in the community.

2.6 Prevalence of Hepatitis A in the Community

In Australia, there were 2,503 notifications of hepatitis A infection during 1998, at a rate of 13.4 per 100,000 population (Thomson et al. 1999). The largest number of reports were from Queensland at 1042 and NSW at 945 respectively. The 1998 Annual Report of the NNDSS recorded the highest notification rates for hepatitis A were from Queensland (30.1 per 100,000 population), with 70+ per 100,000 population being notified from the Far North and Fitzroy statistical divisions in Queensland. Thomson et al. (1999) also observed in their 1998 Annual Report that the male to female ratio was 1.6:1 for age group specific notification rates and the highest notification rate for males was for those aged 25-29 years and for

females, was for those aged five to nine years. Interestingly, these notifications by sex and age groups are very similar to those observed by Desenclos and MacLafferty (1993) in the Florida County outbreak in 1988-89. For the Wide Bay Burnett division (which includes the Bundaberg region), the reported notification rate of hepatitis A during 1998 was greater than 19 per 100,000 population.

In 1999, notifications of hepatitis A from the Queensland state dataset available to the Central Public Health Unit Network (CPHUN) for the Central, Central West and Wide Bay areas reduced dramatically to 50 cases from 210 cases for the same reporting areas in 1998. However, the rate for 1999 was 12.7 cases per 100,000 population which was slightly above that of the State as a whole, at 10.3 cases per 100,000. The CPHUN (1999 & 2000) further reported that the majority of cases occurred in young adults, with higher rates of infection in females than in males for both years 1998 and 1999. The Communicable Diseases Unit (CDU) at Queensland Health advised that for the three month period January to March 1999, hepatitis A notifications for the CPHUN were 22, 20 and nine cases respectively. Most were in the 15 to 39 years age group (63%) and there were less males than females (0.8:1) (CDU, 1999). These similar patterns of infection in females are generally attributed by authorities to their more traditional roles as care givers in the domestic setting and in day care facilities. Specific notifications of hepatitis A for the Bundaberg region (population 83,062) in 1999 was two cases, at a rate of four point five cases per 100,000 population (CPHUN 2000).

2.6.1 Prevalence of Hepatitis B in the Community

Notification of HBV to the National Notifiable Diseases Surveillance System (NNDSS) began in 1993, with a peak of 328 cases in 1994, decreasing to 226 cases Australia wide in 1998 (NHMRC 2000). Thomson et al. (1999) reported that there were 261 incident cases in 1998 notified to the NNDSS, with a national notification rate of 1.4 cases per 100,000 population. The highest rates were from Northern

Territory, Victoria and Western Australia. The majority were in the 15 to 34 years age groups, with males exceeding females in the ratio of 1.8:1. Additionally, in 1998 there were 6,682 unspecified cases of hepatitis B notified at a rate of 35.6 per 100,000, slightly lower than the 1997 rate of 38.4 per 100,000. The male to female ratio for unspecified cases was 1.2:1. Queensland recorded the third highest rate of notification of unspecified hepatitis B at 28.9 cases per 100,000 population (Thomson et al. 1999).

The notifications for hepatitis B for the CPHUN reporting areas for 1998 and 1999 were similar, with 33 and 37 cases (acute, chronic and unspecified) respectively. The CPHUN (1999 & 2000) further report the rates at 7.4 and 9.3 cases per 100,000 population for 1998 and 1999 respectively. Most notifications for the Central areas were for adults between the ages of 15 and 45 years. Specific notifications for hepatitis B for the Bundaberg region (population 83,062) in 1999 was eight cases, at a rate of 18.2 cases per 100,000 population (CPHUN 2000).

2.7 Occupations at Risk of Hepatitis A

Apart from those individuals whose occupations involve travel, a few occupations in Australia are associated with significant occupational exposure to the hepatitis A virus (Bell, Crewe & Capon 1994; Gust 1992b; NHMRC 1997, 2000; SmithKline Beecham 1997). The individuals who have been defined at high occupational risk include those caring for young children in day care centres, teachers of the intellectually disabled, staff and residents of residential facilities for the intellectually disabled, health workers and teachers in remote Aboriginal and Torres Strait Island communities, nursing staff, cleaners and other health care workers in pediatric wards and infectious disease wards (NHMRC 1997, 2000). Battegay et al. (1995) also report that staff of and children attending day care centres, especially centres open to children in nappies and for more than 15 hours daily are particularly at high risk. Other means of infection are by sexual contact with infected

persons, injecting drug users and transmission from an infected blood donor. Casual contact as in the usual office, factory or school setting, does not spread the virus. (Battegay et al. 1995; Benenson 1990; NHMRC 1994). More particularly, the NHMRC (1994, 1997, 2000) in their last three editions of the *Australian Immunisation Handbook,* have identified those workers in occupational situations such as long day child care centres, where the children have not been toilet trained, as being associated with significant occupational risk.

The NHMRC (1997, 2000) and Shakespeare and Poole (1993a, 1993b) further identify sewage workers as an occupation with a significantly increased risk of hepatitis A infection due to exposure to faecal matter and faecal contaminated aerosols and sprays. Both Shakespeare and Poole (1993a, 1993b) and SmithKline Beecham (1995) also comment on the significance of the risks to sewage workers because (i) operators of high pressure water hoses used to unblock drains may be infected from the mists and sprays generated, (ii) equipment and protective clothing are often contaminated with faeces; and (iii) contaminated protective clothing may not be removed before eating and smoking. While early study reports by Shakespeare and Poole indicated a significantly increased risk of infection with hepatitis A for sewage workers in the occupational setting, it must be stressed that their findings have been questioned by Maguire (1993). She suggests that it was difficult to draw such conclusions because of the study's small size, introduced bias as cases and controls volunteered, analysis was not a matched analysis and odds ratio results for sewage workers were different after re-analysis of data presented.

Shakespeare and Poole (1993b) in their study drew attention to a shortage of empirical evidence to support the hypothesis that workers are at occupational risk of hepatitis A and would therefore clearly benefit from an immunisation protocol. Their research involved comparing the prevalence of antibodies to hepatitis A virus in two occupational groups with the prevalence in controls matched for age and social class. Forty sewage workers (with 18 road workers as controls) and 53 carers

for people with learning disabilities (with 20 office workers as controls) were assayed for hepatitis A virus immuno-globulin G (1gG) with ten mls of blood taken from each person. This cross-sectional study found that sero-positivity was significantly more prevalent in sewage workers than controls (OR: 2.60; 95% CI 1.04 to 6.51), but not in the carers (OR: 1.07; 95% CI 0.45 to 2.58). Although the study was small, the results do indicate an increased risk of infection with hepatitis A virus for those exposed sewage workers. In their study, Shakespeare and Poole (1993b) identified a number of work practices as probable routes of infection and concluded by calling for tests of larger samples of workers for an association between length of employment, type of work performed and infection with hepatitis A virus. Their conclusions suggest support for the findings of both Mutton and Gust (1984) and Bitton (1994), who have also expressed some doubts in relation to the true picture of dissemination of HAV in the workplace from mists, sprays and vapors.

An epidemiological study in Antwerp, Belgium by Van Damme et al. [sic] in 1992 (cited in Shakespeare & Poole 1993b) has also shown a higher prevalence of sero-positivity to hepatitis A in staff in a paediatric hospital. They suggest that this is an indication of an increased risk of catching hepatitis A amongst health care workers in paediatric units. However, the VHPB (1995) are cautious when it comes to the actual levels of hepatitis A risk for both health care workers and sewage workers. They are not convinced that there is enough epidemiological evidence to support the hypothesis that these two specific occupations are at increased risk for hepatitis A. The VHPB concludes by recommending more studies to establish the occupational risk of hepatitis A specifically for health care workers and encouraging further cost effectiveness studies of HAV prevention strategies for all occupations at risk.

Gust's (1992b) earlier study identified that higher rates of infection were seen in both sewage workers and male homosexuals because their occupations and practices brought them in contact with human faeces. However, in a more recent

investigation, De Serres and Laliberte (1997) undertook a case study following a hepatitis A outbreak among three workers in a waste water treatment plant in the Quebec City area of Canada. This particular occurrence among sewage workers occurred during a small community outbreak involving 16 cases between June and September 1995. Their study found three main sources of contamination: splashes by waste water and sludge, aerosols and hand contamination. The three sewage worker cases were confirmed by IgM serology. The 16 serologically confirmed cases lived in a small island community in which the sludge from the septic tanks of the houses was treated in the Quebec City waste water treatment plant. This plant was reasonably new, built in 1991 with all installations being indoors. While aerosol and splash exposure by workers could be controlled by masks, rubber protective clothes, face shields and other devices, the De Serres and Laliberte study found it difficult to control for every source of infection (such as, inadequate hand washing) in this particular workplace. For example, they found that hand washing was not as efficient as it should have been because the observed workers recontaminated their hands after turning off taps, opening the door to leave the work area, touching their clothes and transporting their tools and equipment. This Canadian study concluded that despite the actual incidence of hepatitis A being low in this workplace, there was a real possibility of sporadic exposure to the virus during future outbreaks. They confirmed that hepatitis A is an occupational hazard for sewage workers because despite vaccination, it is impossible to avoid all contact with sewage fluids. This finding provides evidence in support of Gust's (1992b) earlier assertion of increased occupational HAV risks for sewage workers. Interestingly, this case study also suggests that a small community outbreak can be a source of exposure for a population of susceptible workers. The implications for workers in child care settings are that they too would also seem to be at risk of hepatitis A infection in community outbreaks if placed in similar situations of potential contamination through poor personal hygiene practices in the workplace.

The Viral Hepatitis Prevention Board (VHPB) (1995) have also made the observation that staff and carers at day care centres are at high risk of HAV because of occupational exposure. This statement was based upon their analysis of previous epidemiological studies and disease surveillance worldwide (VHPB 1995). Notwithstanding the risk in such settings, the Board however do make the comment that occupation must not be confused with other sources of hepatitis A infection such as contaminated food, infected plasma or a carrier incubating the disease for an unsuspecting potential host. This statement could either imply that being in the occupation exposes the individual to the risk of hepatitis A infection or that the occupation itself is a source of hepatitis A infection. They conclude that the hypothesis, 'that workers exposed to faeces are at increased risk of hepatitis A' needs thorough and on-going testing (VHPB 1995, p. 2).

2.8 Hepatitis A Outbreaks

Several studies have investigated the role of young children in community wide outbreaks of hepatitis A. In May 1993, the Eastern Sydney Public Health Unit was notified of a case of hepatitis A in a three year old girl (Ferson et al. 1994). No household contacts of the case were affected, but it was noted that the girl was an attendee at a local pre-school. This pre-school in Eastern Sydney was attended by 25 children including 16 Aboriginal children and in the care of five staff carers. All children were toilet trained, but accidents were not uncommon. Over the next two months, 15 cases were reported including 2 siblings. With parental approval, blood samples were collected from 16 of the children. No cases were reported on staff carers, but a nurse from a nearby hospital, who had looked after one of the children absent from the pre-school on the day of blood collection, developed jaundice and was subsequently found to be HAV IgM positive. Ferson et al. (1994) undertook serological testing of 19 of the children, with 63% presenting evidence of either recent or past HAV infection. Of the cases reported, all but two were asymptomatic, whilst only older contacts presented with jaundice, implying perhaps that if early

intervention with immunoglobulin had been administered after initial notification then a reduction in reported cases may have occurred.

Outbreak management included hygiene precaution strategies and recommendations for use of normal immunoglobulin for staff, all household contacts and remaining susceptible or untested pre-school children. This outbreak followed similar transmission patterns to those previously reported by Hadler et al. (1980), Hadler et al. (1983) and Hanna (1993), and again emphasised the significance of children in child care being involved in the transmission of HAV in close communities. Ferson et al. (1994) suggested that mass use of immunoglobulin upon serological notification interrupted the transmission and halted the outbreak in this community.

To assess risk factors for illness during an outbreak in 1985-86 in the State of New York (USA), Smith, Grabau, Werzberger, Gunn, Rolka, Kondracki, Gallo and Morse (1997) reviewed case records and randomly selected 93 households from a Hasidic Jewish community for interview and serologic survey. In the outbreak, 117 cases of hepatitis A were identified, with the highest attack rate (AR) at 4.2% among three to five year olds. The presence of three to five year olds among the surveyed households was the only risk factor that increased a household's risk of hepatitis A (indeterminant relative risk, $P = 0.02$). Smith and colleagues (1997) found that case households from the outbreak were more likely to have been three to five year olds than were surveyed control households (OR: 16.4; $P < 0.001$). They concluded that three to five years old children were more likely to have hepatitis A and may have been the most frequent transmitters of the disease in this community outbreak. This study suggests that hepatitis A vaccination of three to five year olds could protect this age group and thus prevent future outbreaks in the community. Both of these studies (Ferson et al. 1994; Smith et al. 1997) also suggest that the presence of children plays a major contributing factor in hepatitis A community outbreaks.

Gust's 1992 study of different patterns of hepatitis A virus worldwide found that the true incidence of clinical hepatitis in developed countries is four to five times more than is currently reported (Gust 1992b). An analysis of morbidity data available to him at that time suggested seasonal climate factors but findings for the reasons of climatic influences were not clearly understood. Further, Gust (1992b) drew attention to the fact that the age distribution of hepatitis A seemed to follow a pattern similar to poliomyelitis, with incidences being directly related to hygiene and sanitation levels.

HepatoCite, the International Hepatitis Update, reported a number of articles by guest editors that address the changing clinical pattern of hepatitis A virus and its likely cost to the community (Van Damme, Van Doorslaer, Tormans, Beutels & O'Grady 1995). They conclude that as the endemicity of hepatitis A virus decreases due to better hygiene and improvements in the standard of living, exposure to hepatitis A virus and subsequent infection is occurring later in life. This shift will result in a proportionate increase in the number of cases of severe illness and fulminant hepatitis. Fulminant hepatitis is defined as the very sudden onset or increasing severity of jaundice, deterioration in liver function, drowsiness and eventually coma (Specter 1999). Additionally, since some early studies were conducted more than ten years ago, incidence rates may well have also changed (Steffen 1995). Further, O'Grady (1995) states the most important prognostic factor for hepatitis A seems to be age, with adults being susceptible to more severe disease than infants or children. Tsukada et al. [sic] (1995) also suggest that age, alcohol intake by individuals and any other underlying diseases are also major factors in the development of severe hepatitis A disease.

Some documented hepatitis A outbreaks have been spectacular including the ingestion of contaminated shellfish by 600 Swedes in 1956 and the Shanghai epidemic of 1988 with contaminated clams which involved more than 310,000 people (Gust 1992b; Battegay et al. 1995). For example, the Shanghai outbreak in

China between January and May 1988 was most common among adults between the ages of 20 and 40 years (90.8%), requiring 8000 hospitalisations and causing approximately 50 deaths (Lewis 1999). This was found to have been brought about because the older population was largely immune (due to previous exposure) and the clinical disease was uncommon in young children (Battegay et al. 1995). More recent studies have now demonstrated the prolonged survival capacity of the virus in living shellfish and the capacity of bivalves to act as potential reservoirs of HAV in outbreaks (Enriquez, Frosner, Hochstein-Mintzel, Riedmann & Reinhardt 1992; Xu, Li, Wang, Xiao & Dong 1992). Although there are many types of food that have been involved in hepatitis A outbreaks, raw or partially cooked shellfish such as clams, mussels and oysters continue to be one of the most important vehicles for transmission (Bitton 1994; Gust 1992b; Rippey 1994). The reason for this is because as filter feeders bivalve molluscs filter large volumes of water (four to 20 litres per hour), they live in estuarine environments often contaminated by domestic wastewater effluents and they tend to concentrate bacteria, viruses, toxins, heavy metals, pesticides and hydrocarbons which may be present (Bitton 1994; Gust 1992b).

Waterborne transmission of hepatitis A continues to be documented worldwide (Bitton 1994; Rippey 1994) and although these authors conclude by reporting low numbers of actual cases and outbreaks per year, the high mortality rates involved are of significant public health concern. For example, in Australia the death of a 77 year old man resulting from hepatitis A infection due to ingestion of contaminated oysters in the 1997 Wallis Lake contamination incident on the New South Wales mid-north coast was reported in various Australian print media. Hundreds of others across three States were left seriously ill. The Environment Protection Agency reported that this outbreak, spread through sewage contamination, could have been sourced from a number of pollution possibilities. These included heavy rain washing sewage from unsewered urban development into catchment areas, effluent from pleasure boats or from poor or non-existent

sanitation facilities at oyster sheds and depuration plants on Wallis Lake (Nason 1997). These studies confirmed shellfish as a mechanism of food-borne transmission of HAV and that there is a need to thoroughly cook shellfish before consumption to inactivate the HAV.

The importance of good sanitation facilities, hygienic food preparation and appropriate public health education programmes are often key issues in prevention management of communicable diseases within communities. For example, a persisting hepatitis A infection outbreak in a central Queensland town was subsequently identified as being potentially sourced from a breakdown of one or all of these three public health concerns (Dick, Beezley & Scott 1994). From April 1992 to May 1993, Queensland Health received notification of a hepatitis A propagated outbreak from a small central Queensland town. These investigators undertook a case series study together with an investigation of the general ecology of the town and its surrounds. Using prepared questionnaires, cases were asked about numbers of persons in their households, the duration and nature of illness, their occupation, hepatitis A knowledge and potential risk related exposures. The ecological survey constituted inspections of sanitation facilities and food handling practices in the town.

Dick et al. (1994) documented a total of 43 cases in the outbreak, providing a annual crude attack rate of 12.6 cases per 1000 persons. The majority of cases were school children and young adults in the age range five to 24 years. Most cases lived in dwellings with two or more other persons; 16 cases were from households of six or more persons. One case was a chef. Sharing food or drink with a hepatitis A case was reported by 24 persons; only 16 (50%) of the interviewed cases knew what HAV was; 25 (78%) knew how it was spread and only 16 (50%) knew how it was prevented. Inspection of sanitation facilities and food handling practices found: misuse of an approved parcel of land as a sanitary depot for disposal and burial of nightsoil, non-compliance with conditions of authorisation of use for the refuse tip, a

quarter of all houses had poorly sited, ill-repaired or poorly maintained septic tanks, 20% of house yards provided harbourage for vermin, there was heavy fly breeding at the refuse tip and the unapproved nightsoil depot, no formal drinking water sampling program existed, and there was poor understanding by food handlers of their responsibilities and obligations under the relevant health regulations (Dick et al. 1994).

The authors noted that this outbreak was typical of a person to person propagation with actual numbers affected never being completely determined. An symptomatic to asymptomatic ratio of 1:4 was observed. They also noted that the age pattern of those notified as affected corresponded to that observed in communities where the population was largely vulnerable. This case series study provided no information about statistical association, as commented by the authors. The benefit though lay in its identification of issues of public health and the importance of clean water and good hygiene practices before vaccination and other measures are undertaken in the prevention of disease.

Studies have also shown that behavioural characteristics and close contact between people make HAV transmission difficult to control (Bell, Crewe & Capon 1994; Gust 1994). For example, Bell et al. (1994) conducted a cross-sectional serological (radioimmunioassay technique) survey of 270 permanent residents in a centre for people with developmental disabilities in western Sydney. This followed earlier identification of 11 cases of HAV in the centre. Blood samples were collected from 259 residents (96%) and demographic information on 266 of the 270 (98%) permanent residents. One nursing staff member was later identified as having contracted HAV. Serological testing revealed anti-HAV in 128 residents tested (49%) indicating past HAV infection; that is more than half of the residents were found to be susceptible to HAV infection. As residents were housed according to the type of disability, the study reported strong serological evidence (adjusted odds ratio) of HAV infection associated with living in specific residential units.

On the other hand, the study revealed that residents' age and length of stay at the centre only had a small effect while gender was found not to be a risk factor. Bell and her colleagues observed that while specific behavioural factors were not associated with evidence of HAV infection, they suggested that such factors probably contributed to the ready transmission to other susceptible residents in the same units (Bell et al. 1994). This study concluded that even though residents required help with daily activities, carers of faecally incontinent people and others in contact with them, were also at increased risk of HAV infection and therefore should be included in vaccination programs as well.

Gust's (1994) review of HAV in institutions also cited a number of earlier studies by other colleagues as far back as the 1950's that determined infectious diseases such as hepatitis were a recurring problem in such settings. These studies, some lasting over a decade, reported periodic outbreaks of respiratory and diarrhoeal 'type' diseases associated with overcrowding, poor standards of personal hygiene and poor supervision in institutions such as state run schools. His 1994 review concluded that staff and residents of institutions and travellers to endemic areas as well as other individuals who were likely to come in contact with human faeces were at increased risk of infection and should be vaccinated (Gust 1994).

2.9 Hepatitis A in Child Care Settings

In the child care services industry, infectious diseases that commonly occur among children are often communicable or contagious. A contagious disease means that it can be passed or spread very easily from one person to another and is the same as the more popular term, infectious disease. The ease with which a disease spreads is brought about because of the close bodily contact and interactions between workers and the infants in these settings. Moreover, children, especially those in groups, are more likely to contract infectious diseases than are the adults

because of factors related to their age and developmental stages and also to any environmental and economic problems associated with child care centre programs (Aronson 1991). These factors include body size and structure, immature immune systems, hygiene (both personal and environmental), breaks in normal sanitary routines, physical interactions, worker illness, design of the child care facilities and staffing resources including numbers, patterns and shift changeovers (Aronson 1991). Research by the School of Community Medicine (SCM) plus other research by Wald and others showed that this is particularly the case when compared to children in care at their own homes because of the inherent risks of infection associated with group settings (SCM 1994; Wald et al. 1988). In the context of the child care setting, the term 'adults' refers specifically to child care centre workers or providers as well as the parents of the children in care.

Aronson (1991) goes on to state that hepatitis A is a special problem in the child care setting where infants and toddlers are concerned particularly when good hand washing is not routine, because the virus that causes hepatitis A may survive on fomites such as objects, toys and playthings for weeks. Child care is labour intensive, involving many close physical interactions among the children and adults. For example, toileting, nappy changing, meal and snack service, shared objects, affectionate kissing, touching, lap sitting, use of water tables and sharing moist art materials. For very young children and infants, frequent body contact forms an essential part of the caring process and each of these contacts is an opportunity for transfer of the germs and infective organisms that cause infectious diseases. A special effort is required by workers and carers to reduce the risk of infection without losing the loving, caring and developmentally appropriate activities required for good quality child care (Aronson 1991).

One of the ways to ensure protection from infectious diseases common in child care centres is to adopt the best standards of hygiene in that environment. Such hygiene standards are necessary because all the common infections in child care

centres are spread through person to person contact and from contaminated surfaces. In New South Wales (NSW), the Department of Community Services (DCS) (1993) state that the susceptibility of young children to infection as they build up immunity and the unhygienic behaviour of young infants, also helps to spread infection in such workplaces. Another prevention strategy is to ensure child care workers maintain up to date immunisations against communicable diseases. The NHMRC (1994, 1997) state that those caring for young children in day care centres, particularly in situations where children have not been toilet trained should be vaccinated on account of the level of occupational risk from such physical interactions.

Investigations by the School of Community Medicine (SCM) at the University of NSW and others also report that workers in the child care setting will be exposed to a range of infectious diseases more frequently than will be someone who has less contact with children (NHMRC 1997; SCM 1994). For example, the study by the SCM in 1992 and 1993 of 81 long day care centres in NSW found that children under two years old, attending centre based care, were more likely to have higher infectious disease rates than children being cared for in their homes. While children didn't normally have lasting health effects, the study found that these illnesses did cause short term problems for staff workers and parents. The Department of Human Services and Health (DHSH) and others identified that some of the infectious and notifiable diseases that are encountered in the child care occupational setting include chicken pox, scabies, cold sores, rubella, pneumonia, meningitis, gardia, hepatitis A, hepatitis B and salmonella. (Aronson 1991; DHSH 1994; NHMRC 1997, 2000; Sebastian 1987; SmithKline Beecham 1993, 1996). Many of these infections also affect unborn children of pregnant child care workers.

Battegay et al. (1995) in their review also identified that the staff of and children attending day care centres especially in large centres open to children still in nappies and attending for more than 15 hours daily, were one such 'at risk'

significant group. In their findings, they recommended that if one or more children or employees are diagnosed with hepatitis A or cases are diagnosed in two or more households of centre attendees, then staff and attendees of day care centres attended by children in nappies should be automatically immunised. By implication, if persons including parents have close contact in any way with local populations at risk, then they too should be immunised.

The VHPB (1995) advise that hepatitis A among little children will be under reported due to the asymptomatic nature of infection at lower ages. Because of the tendency of hepatitis A to spread within residential groups and neighbourhoods, the VHPB also inform that it is very probable that physicians and clinicians do not always seek laboratory confirmation for each suspected hepatitis A case. Therefore, it could be suggested that actual incidence of HAV could be considerably higher and distribution different to that presently reported. Findings by the VHPB (1995) in their reviews indicate that employment or attendance at day care centres over a study period of years 1979, 1989 and 1991 accounted for 12 to 18% of cases in the UK and US. The Board also is of the view that the data from these day care outbreaks suggests that it is difficult to control enteric transmission in centres, especially when caring for children who are not fully toilet trained (VHPB 1995).

There have been a number of investigations which have highlighted the concerns and relationships between children, employees and hepatitis A infection in child care settings. For example, in an extended assessment conducted in Arizona, USA over the period August 1977 to May 1978, Hadler and his colleagues found that 42% of all reported cases of HAV occurred in persons closely associated with child day care centres, in their family contacts or in day care centre staff (Hadler et al. 1980). This study of community wide child care determined that child day care centres were important in the spread of HAV. As an epidemiological study, it was conducted over a ten month period to investigate the spread of HAV in child care centres in Maricopa County, Arizona. Statistical analysis was completed with the

chi-square test with Yates' correction or with Fisher's exact test. Hepatitis cases were identified at 92 of the 308 child care centres in the county, involving a total of 1008 reported cases. Of these, 30 centres had clusters of HAV cases in three or more families, satisfying the criteria for hepatitis outbreaks; 28 centres were investigated in detail. Of the outbreak cases, 17% occurred in day care children and 15% in day care employees. Another 31 cases occurred in persons such as babysitters and grandparents, who were not in the household but who regularly took care of a day care child whose parents also had hepatitis. The remainder of cases were out-of-centre contacts of the children such as parents and relatives. HAV rates were highest for day care centre employees (121 cases per 1000 at risk), with significantly lower rates for household contacts (40 cases per 1000 at risk) and children attending day care centre (22 cases per 1000 at risk); [$p < 0.001$].

Hadler and others observed that the 57 cases of HAV in child care centre attendees were distributed relatively evenly among children aged two years and over, with few cases recognised in children younger than two years (Hadler et al. 1980). However, HAV infection in both employees and household contacts was strongly related to contact with children aged two years or less attending day care centres. The HAV infection rate in employees who worked regularly with infants or toddlers less than two years of age was four times that for employees who regularly worked with older children. The authors concluded that transmission of hepatitis A in child care centres is common, with outbreaks occurring in 10% of the county's 308 centres during the ten month study interval. The study confirmed the characteristic asymptomatic spread of hepatitis A among young children and demonstrated the primary role of children aged one to two years in outbreaks in day care hepatitis. Hadler et al. (1980) also found that poorly developed hygiene and toilet habits of this age group result in the frequent transmission of infection in day care centre employees and to adult contacts at home. This study involved large day care centres, with average enrolments of 50 children and high proportions (25%) of children less

than three years of age. This research also suggested special emphasis should be placed on personal hygiene of employees at the centres and of parents in the home.

Jacques, Moens, Van Damme, Goubau, Vranckx, Steeno, Muylle and Desmyter (1994) have also suggested that appropriate measures should be taken for occupationally exposed groups at risk of faeco-oral contact with very young children. A prevalence study of 591 female employees in day nurseries in Flanders, Belgium was undertaken using a reference group of 560 healthy female blood donors, matched for age. Analysis was performed on formerly exposed persons (n = 413) versus blood donors (n = 560). The overall prevalence of HAV markers (anti-HAV antibodies IgG/IgM) was 48.4% (95% CI: 44.2, 52.5) in exposed day nursery personnel, compared with 42.9% (95% CI: 38.7, 47.0) on blood donors. The age specific prevalence rates showed a steeper rise from the age of 30 years among the exposed employees than among the blood donors, with significantly higher prevalences between 35 and 44 years of age. Discrepancies levelled off above 60 years of age. Results from this study are also in line other studies, with findings of higher prevalence of HAV markers among groups of workers professionally exposed to small children (Reeves & Pickering 1992).

By contrast, the indication that child care providers as an occupational group are at increased risk of HAV infection and therefore should be immunised has been questioned by Jackson, Stewart, Solomon, Boase, Alexander, Heath, McQuillan, Coleman, Stewart and Shapiro (1996). In their investigations, Jackson and others obtained sera samples for testing of antibodies to hepatitis A and a number of other communicable diseases from a sample of child care providers in King County, Washington (Jackson et al. !996). There was no outbreak in this community at the time of sera sampling. They also administered a questionnaire to assess employment characteristics and other potential risk factors for infection. They compared anti-HAV seroprevalence among providers with that of subjects in the Third National Health and Nutrition Survey, representative of the general population. It was

observed that 13% (48 of 360) of providers were anti-HAV positive (46% [22 of 47] of foreign born versus 8% [26 of 313] of US born [$P < 0.001$]). In multivariate analysis, anti-HAV seropositivity was associated with foreign birth, age, income and Hispanic ethnicity but was not associated with characteristics of employment. Seroprevalence among US born providers tended to be lower than that of National Survey subjects of similar age, sex, race and income. This study concluded that anti-HAV prevalence among US born providers was low, and seropositivity was not associated with employment characteristics. These findings indicated that occupational exposure to HAV is uncommon under non-outbreak circumstances, suggesting that perhaps increased risks of infection for this group are not so well defined as previously thought. The Jackson et al. (1996) study challenges the generally accepted view that child care workers and providers are at risk of HAV infection in their occupational environment, albeit this study was undertaken during non-outbreak conditions. The authors made no allowance for the asymptomatic nature of HAV infection in young children (that is, infants have few specific symptoms presenting) and the diagnosis may sometimes be missed in this age group.

With regard to local data, Gust, Lehmann, Crowe, McCrorie, Locarnini and Lucas (1985) reported an outbreak within one specific family group in Victoria, in October and November 1976. This outbreak of hepatitis A occurred at Kangaroo Ground, a semi-rural area on the northern outskirts of Melbourne. All nine members of one family developed hepatitis A. Their ages ranged from 20 months to 35 years. Contacts were traced and a cousin was found to have been jaundiced one month prior to the onset of illness in the family. This relative attended a local school at which an outbreak of HAV was also reported to have occurred. Neighbours of the affected family subsequently presented with hepatitis, also suggesting further person to person transmission. The authors stated that the full extent of the outbreak was not known.

In another outbreak, Hanna (1993) described a series of individuals who developed hepatitis A associated with a large child day-care centre in north Queensland. Toddlers in nappies accounted for 20% of the total daily enrolment. Passive vaccination via the administration of human immunogloblin was offered to the day care centre employees soon after the initial primary case was recognised. Widespread administration of immunogloblin to children attending the centre and household contacts of child attendees still wearing nappies was undertaken when it was recognised that five families were affected by the day care centre outbreak. Although six parents of children attending the centre became symptomatic for hepatitis A, no staff members developed the disease. The author concluded that hepatitis A vaccine be recommended for sero-negative child care employees who are involved in the care of young children still wearing nappies.

Tallis et al. (1996) also reported an outbreak of hepatitis A associated with a child care centre in surburban Melbourne. The centre had 46 child care placements and employed 13 staff. It was located in two adjacent houses, one for infants and toddlers up to two years old, the other for pre-school age children aged three to five years. Between September and December 1995, nine cases of hepatitis A were identified, including three staff members, five parents and one sibling of a child in the infant-toddler group at the centre. There were no clinical cases of hepatitis A recognised in children at the pre-school. However, one of the affected staff members worked in the infant-toddler group house and also had a child in this group. Yet further investigation revealed that another staff member worked in the pre-school group house and her own child attended the infant-toddler group. Tallis et al. (1996) suspected that HAV infection was occurring in the children some weeks before the first adult case and continued until mid to late October. The authors warned medical practitioners to be alert to the possibility of a 'silent' outbreak of hepatitis A among small children in a child care centre when parents or siblings of such children, or staff of a centre, present with hepatitis A. They also advise that staff of centres where there are children in nappies should receive inactivated hepatitis A vaccine. This

investigation reinforces the ease with which HAV is spread from nappy-wearing infants in child care settings and the possibility that recognised cases in child care centres may in fact be tips of a much larger iceberg.

In another Australian report, Davison et al. (1996) described an outbreak of hepatitis A associated with a child care centre in surburban Brisbane. There were 44 children and 13 staff attending the centre at the time of the outbreak. The researchers observed that none of the staff members had been vaccinated against hepatitis A. On notification of the outbreak, prophylaxis with normal human immunogloblin was recommended for all children and staff, and written advice on hygiene precautions was issued. A total of nine cases of hepatitis A were diagnosed over a nine week period in persons associated with the centre. Five clinical cases were reported: two staff members and three parents or grandparents. Four sub-clinical cases were detected: two toddlers, the mother of a toddler and two year old child. There was one family cluster associated with a toddler who had sub-clinical infection; the child's mother also had a sub-clinical infection while the father and grandfather had clinical infections. The first three clinical cases (which included two staff members) were all associated with a toddler group and were considered to have been infected from the same source. The authors concluded with the fact that two staff members having clinical infections supports the NHMRC immunisation recommendations for individuals working in day care situations with children too young to be toilet trained (Davison et al. 1996). This study provided further evidence that during an outbreak when most adults develop HAV symptoms, they often require hospitalisation. These results also support the previous findings that infants and children who do not show symptoms of hepatitis A may be a source of infection to others (Davison et al. 1996; Hadler et al. 1980; Hadler et al. 1983; Hadler & McFarland 1986; Hurwitz et al. 1994).

In a more recent Victorian study, Thomson et al. (1998) examined the self-reported hepatitis A and B immunisation status of child care workers, the level of

awareness among child care workers of the NHMRC recommendations for immunisation against hepatitis A and centre practices. This study was conducted as a confidential mail survey in June 1996 with workers and centre coordinators (that is, directors) from 113 randomly selected child care centres. Coordinators completed a questionnaire on the centre's characteristics and immunisation policy. Child care workers completed a second questionnaire on their immunisation knowledge or beliefs and immunisation status. A total of 95 centres (85%) and 607 (74%) workers participated. Only 11% of workers were vaccinated against hepatitis A, although the majority of respondents believed their occupation placed them at increased risk.

Thomson et al. (1998) also found that those vaccinated were more likely to be aware of the availability of hepatitis A vaccine, of the NHMRC recommendation for hepatitis A vaccination and to have been vaccinated for hepatitis B. Centres in which coordinators perceived hepatitis A vaccination as important and those which recorded staff immunisation, particularly hepatitis A, were more likely to have child care workers who were vaccinated against hepatitis A. In contrast, this study found nearly two thirds of child care workers reported that they were vaccinated against hepatitis B, although hepatitis B was not routinely recommended by the NHMRC for child care workers. These findings showed a need for further policy and educational initiatives in the implementation of an immunisation strategy for child care workers. Thomson et al. (1998) highlighted a lack of awareness amongst both workers and coordinators of the increased risks of HAV within the child care setting. They based this conclusion upon the poor rates of vaccination against hepatitis A. This also suggests a lack of knowledge about such issues by surveyed workers (n = 607) in Victoria, despite 79% of workers changing nappies at least weekly (Thomson et al 1998). The relevance of these findings should not be under estimated by authorities, policy makers and managers of centres, particularly regarding levels of compliance with the NHMRC immunisation recommendations for child care workers. This study also suggests that employers have a larger role to play in making staff more aware of the recommendations.

2.10 Conclusion

It has been documented that child care workers are not generally aware of the risk factors associated with hepatitis A infection (Ferson 1993, 1994; Hadler et al. 1980; SmithKline Beecham 1996; Stapelton 1999). There are many factors contributing to this lack of awareness including inconsistent hygiene practices, worker level of knowledge, age, complacency toward seeking health advice, poor and inconsistent training and currency of policy and procedures for infection control. Child care centres have been linked with outbreaks of hepatitis A amongst staff and children (Desenclos & MacLafferty 1993; Ferson et al. 1994; Hadler et al. 1980; Hadler et al 1983; Hadler & McFarland 1986; Hanna 1993; Heath et al. 1997; Hurwitz et al. 1994; Staes et al. 2000; Stapelton 1999; Tallis et al. 1996; Thompson & Kennedy 1998; Thomson et al. 1998). A number of factors have been shown to be associated with the risk of hepatitis A infection in the child care setting (Davison et al. 1996; Gust et al. 1985; Hadler et al. 1980; Hadler et al. 1983; Hadler & McFarland 1986; Hanna 1993; Jackson et al. 1996; Jacques et al. 1994; SCM 1994; Tallis et al. 1996). These have included centres opening for longer hours, larger numbers of children particularly less than three years of age, the presence of children (non-toilet trained) in nappies, poor personal hygiene and the asymptomatic nature of HAV in pre-schools (Hadler et al. 1980; Hadler & McFarland 1986; Hanna 1993; Jacques et al. 1994; Staes et al. 2000; Stapelton 1999; Tallis et al. 1996; Thomson et al. 1998). However, other studies have also questioned the level of awareness of infectious disease and risk potential in workplace settings including child care (Jacques et al. 1994; Maguire 1993).

Young children do play an important role in transmitting HAV to older, more susceptible individuals during community outbreaks (Hadler et al. 1980; Hadler & McFarland 1986; Jacques et al. 1994; Merritt, Symons & Griffiths 1999; Mullin & Stehr-Green 1991; Reeves & Pickering 1992; Smith et al. 1997; Tallis et al 1996). This

is in part due because of their lack of bowel control and attention to hygiene and the need for adult supervision of their toileting needs (Aronson 1991). Health issues within the child care setting tend to predominantly focus on the well being of the children. On the other hand, the occupational health rights of staff at child care centres appear to have been neglected.

From the literature, many investigators have made mention of the need for further studies to confirm the importance of occupational exposure in HAV transmission (Gust 1992b; Hadler et al. 1980; Hadler et al. 1983; Specter 1999). This need, to be able to easily recognise hepatitis A in day care centres, particularly in adults (parents and staff) was also emphasised by Hurwitz and others in their review of current knowledge (Hurwitz et al. 1994). Previous studies have highlighted that there is also a need to continue to educate and to find innovative ways to train those 'at risk' groups about prevention and vaccination strategies (Specter 1999; Thomson et al. 1998; Van Damme et al. 1995).

The VHPB (1995) recommend that studies to clearly assess the risk for workers exposed in workplaces are needed to gauge whether occupational exposure is a significant public health problem. As cited by Dr. Elizabeth McCloy, Director and Chief Executive of the Civil Service, Occupational Health in the U.K.: 'Studies to establish the role of occupation in hepatitis A infection are needed. The hypothesis that workers exposed to faeces are at an increased risk of hepatitis A needs thorough testing. We need better quality data to be able to inform workers, employers and others of the true risk.' (VHPB 1995, p. 2). On the other hand, Bell et al. (1994) in particular state clearly that there is no recent Australian data with which to compare local anti-hepatitis A virus prevalence.

From the foregoing it is deduced that studies which assess the potential risks of workers exposed at the workplace are needed in order to gauge whether occupational exposure is a significant public health problem. With this in mind, it

was therefore proposed that a study would evaluate the current pattern of self reported hepatitis A immunisation in an 'at risk occupational group', more particularly child care workers in the Bundaberg community. A study of local long day care centres will provide a useful body of contemporary data. Because evidence from other studies also suggests that additional risk factors affect the incidence of hepatitis A virus infection in an occupational setting, this study will also examine for possible association between age, length of employment, education level, and personal hygiene (hand contamination).

Grantham (1992) suggests that workplace health and safety professionals should always be receptive to the possibility that workplace factors may provide the surest basis for long term improvements in preventative occupational health. Occupational studies form a vital part of preventative health on disease occurrence in the workplace and causative exposure. Whilst implementation of vaccination strategies for staff as recommended by the NHMRC (1997, 2000) will significantly reduce the future risk of HAV infection in child care centres, the efficacy of educating centre management and staff about such issues may not be so well known. More particularly, the current investigator suggests that no conclusive evidence exists on the contemporary levels of immunisation against HAV, provision of information and training about HAV, record keeping or levels of awareness amongst management and staff of long day care centres in the local Bundaberg region. Moreover, previous research has not been so localised. As child care centres remain prime sources for outbreaks of community infection, it is also important to investigate whether local long day care centres are meeting the standards for immunisation set by the NHMRC. Based upon the foregoing literature, it is apparent that there is still a considerable shortage of regional knowledge about hepatitis A immunisation issues that affect Bundaberg child care workers.

CHAPTER 3

METHODOLOGY

This quantitative study utilised a cross-sectional design to assess information about the knowledge, beliefs and practices relating to hepatitis A immunisation of child care workers and child care centre directors in the Bundaberg region of Queensland (Creswell 1994). Comparisons between self-reported hepatitis A immunisation levels and self-reported hepatitis B immunisation levels were also undertaken to ascertain if there were underlying misconceptions between the levels of worker risk for hepatitis A and hepatitis B. Information was collected from a sample of child care workers in long day care centres by self-administered postal survey.

The following methodology chapter discusses the essential components of the study including study design, sampling design, sampling strategy, replication decision, ethical issues, data security, research instrument, study sample, pilot study, data collection, data handling and cleaning, and statistical analysis.

3.1 DESIGN OF THE RESEARCH

Research is a way of knowing and thinking about what we know of the world in which we live, what we do and how we critically evaluate our knowledge of universal phenomena, with an aim of establishing a degree of authority about some aspect of ourselves (Bouma 1996; Kumar 1996; Christie, Gordon & Heller 1997). Bouma (1996) suggests that research is a disciplined process for answering questions about the various observable and touchable aspects of the environment and that questions for research can come from anywhere depending upon the level of human curiosity. He further suggests research, as a process of scientific inquiry, is about relating theoretical ideas

to factual data produced during a study undertaking (Bouma 1996). At the end of the research process there is a neither theory nor data but knowledge, and it's this knowledge that contributes to describing, explaining, predicting and even controlling the world in which people live (Polgar & Thomas 1995; Bouma 1996).

However, Polgar and Thomas (1995) advise that research involving human subjects may be conducted using either qualitative or quantitative approaches. On the one hand, qualitative research tends to emphasise the dynamic and holistic aspects of human experience, such as the language of feelings, images, impressions and the qualities of events under study and may collect information without formal, structured instruments. On the other hand, quantitative research begins with pre-conceived ideas, uses structured procedures and formal instruments to collect information, emphasises objectivity in the collection and analysis of information, and analyses numeric data through statistical procedures (Polit & Hungler 1993). For example, in the study of a disease, quantitative research would describe the extent of the pattern of the disease and factors that relate to it in the community, while qualitative research would address the meaning of disease, poverty and caring, and assist understanding of how public health strategies can solve the problems (Baum 1998).

In the present study, undertaking an evaluation of hepatitis A immunisation levels and other associated phenomena amongst child care workers required a methodology that could not only answer questions about how much, how many and how often, but provide the required data from a single contact with the study population - all aspects of a positivist or quantitative methodology (Creswell 1994; Baum 1998). The collected data also needed to be expressed in numbers, percentages and rates because this researcher viewed the subjects objectively, as natural objects in the world and wished to remain detached and neutral by not interacting with those particular informants (Creswell 1994; Neuman 1997). On the other hand, a

qualitative approach would have involved systematic collection of more subjective narratives from child care workers without formal, structured instruments, as a means of understanding and interpreting human experiences in that workplace setting (Polit & Hungler 1993). This type of information was outside the scope of the current research project.

Several authors (Creswell 1994; Polgar & Thomas 1995; Bouma 1996; Neuman 1997; Baum 1998) suggest that the positivist or the traditional quantitative approach is more consistent with such a project methodology because the researcher's values are kept out of the study. In particular, this is achieved in the present study by reporting facts and arguing closely from the data collected. Moreover, the type of information required by this study is described as quantitative by Kumar (1996) because the researcher intends to quantify variations using statistical analysis as opposed to describing variations in phenomena or observations during actual interactions with child care workers. Creswell (1994) also cites that in quantitative studies the nature of the problem arises from the literature. This is because there already exists a substantial body of knowledge and information such as known variables and existing theories from previous research by other investigators. Theories generated from such research may also require re-test and verification, or hypotheses tested by replication of those original studies (Creswell 1994; Neuman 1997). On the other hand, Creswell (1994) further posits that in qualitative studies the theory base does not guide the study because little information exists on the topic and variables are largely unknown, inadequate or incomplete.

Because the nature of the problem in the current study evolves from literature sources including the contemporary study undertaken in 1996 (Thompson & Kennedy 1998; Thomson et al. 1998), it further confirms the choice of the traditional, quantitative approach by this researcher. Creswell (1994) further contends that because quantitative studies utilise carefully worked out rules and procedures for the research, shorter time periods are

involved than that required for qualitative designs and hence, they offer a low-risk, fixed method without ambiguities and possible frustrations. For the present study, the researcher was constrained by such factors as the limitations of time, financial resources and distance and these valid considerations are sufficiently addressed through the choice of a quantitative methodology.

After adopting a quantitative approach for this study, it was useful for the researcher to also consider the method of data collection and analysis. Creswell (1994) suggests two types for use within a quantitative methodology, including experimental with randomised subject selection and quasi-experimental using non-randomised design. However, both these designs involve active manipulation by the researcher of variables under control such as the conditions or groups of subjects. Polgar and Thomas (1995) describe this design as a qualitative study approach. After consideration, this investigator decided the survey method, using questionnaires for data collection at a fixed point in time, would fulfill the quantitative approach of the current study and enable generalisation from the sample to the population (Polit & Hungler 1993; Creswell 1994).

3.2 SAMPLING DESIGN

The sampling design for the study was single stage, with this choice being based upon ease of access to specific individuals in the target or reference population. Creswell (1994) particularly identifies with such a sampling procedure, as it enables the researcher to sample the people directly. With only one contact required with a study population, using quantitative methodologies has the advantage of being comparatively quick to conduct, cheap to undertake and easy to manage and analyse (Polit & Hungler 1993; Kumar 1996). One contact with the study population of child care workers was estimated by this researcher to be sufficient to provide the required data for analysis.

In the current study, the cross-sectional study design approach taken by the researcher was to decide what needed to be found out, identify the study population, select a sample and then to undertake one contact with respondents to elicit the required information. A simple and practical method to study a phenomenon from a selected population where the researcher takes a cross-section of it at one time is known as cross-sectional (Polit & Hungler 1993; Creswell 1994; Kumar 1996; Neuman 1997). It was the intention of the researcher to examine many people at one point in time and then to measure a common set of features on many cases and express them numerically (Neuman 1997). As the study focus was around one period of data collection, this simple design aspect of a cross-sectional study suited the researcher's purpose and was considered appropriate for this type of study.

While the foregoing authors all agree on the suitability of the design for quantitative studies, they express a weakness in the design for measuring and hence, inferring change or trends over time. However, as the current study involved collection of data at one point in time, a snapshot of long day child care centre settings, it did not intend to capture or evaluate change per se. No measurement of change or observations from multiple points in time were intended and therefore such identified design problems were not relevant to the current study.

3.3 SAMPLING STRATEGY

The sampling strategy selected for this study was non-randomised and purposive. Creswell (1994) prefers selecting a random sample, wherein each individual in the sample has an equal probability of being selected; that is, a systematic sample. He states that less desirable is the purposive or judgemental sample, because potential respondents are chosen on the basis of their convenience and availability. However, while a random selection procedure is undoubtedly more rigorous, enabling one to generalise to a

much larger population, the purposive sample was better suited to the smaller, specific situation of the Bundaberg study.

Kumar (1996) responds by citing that purposive sampling is particularly useful when describing a phenomenon about which only little is currently known. Currently, knowledge of hepatitis immunisation amongst long day care centres in Bundaberg is minimal and consequently the sampling strategy of non-randomised and purposive is appropriate for this situation.

As elaborated by Kumar (1996), this researcher did not follow the theory of probability in the choice of elements in the sample, but instead adjudged that all the LDC centre workers themselves would provide the best data about regional hepatitis A immunisation in a child care setting. Secondly, it was apparent, during the initial contact phase with the centres, that staff at these centres were willing to share information and participate in the study. Polit and Hungler (1993) and Neuman (1997) further support the use of purposive sampling as an acceptable kind of sampling technique for special situations when the researcher with a specific purpose in mind, wants a sample of key informants. In this case, the respondents were purposely chosen because they were judged to be special people with particular information about issues under examination (Bouma 1996).

For the current study then, workers at long day child care centres were selected because they were members of a specialist population, they were typical of the population in question and because of their vocation they possessed particular knowledge about the issues under study. However, both Polit and Hungler (1993) and Bouma (1996) caution researchers by advising that generalising findings from a purposive sample to the broader population is risky in most instances. Findings from the current study are not intended to generalise beyond long day workers in the Bundaberg region.

The study was effectively supported by employing the widely used and acknowledged research tool, the survey questionnaire (Polit & Hungler 1993; Creswell 1994; Kumar 1996; Levin & Fox 1997; Rea & Parker 1997; Kuzma 1998). Its use for the present study was justified as the research needed to be undertaken relatively cheaply and performed in a fairly short period of time, both of which are the strengths of this particular research tool (Baum 1998). Further, Baum (1998) also contends that surveys are most powerful when used to collect factual data, which is a particularly important factor in a study of regional child care worker immunisation and also relevant in the context of the quantitative methodology selected for this study. Neuman (1997) and Rea and Parker (1997) are supportive of survey research, stating that it has derived considerable credibility from its widespread acceptance and use in academic institutions and research centres. Christie et al. (1997) cites that the survey is at its best when used to estimate current reality, as is the purpose of this study.

Mindfully, they counter stating the survey is at its worst when attempts are made to use the survey to suggest causal links. However, when the researcher needed to show association to demonstrate causality and make meaningful inferences between some of the variables under scrutiny, a correlation coefficient, Cramer's *phi* coefficient ($\phi 2$), as recommended by Neuman (1997), was applied. This was to indicate the amount of association once an association between two variables had been measured with statistical techniques. Rudestam and Newton (1992) suggest that correlation coefficients may be far more informative to the quantitative research approach by indicating the magnitude of the relationship between variables, rather than the presence or absence of a finding of statistical significance.

Surveys also permit greater anonymity than the face to face interview, particularly in sensitive situations such as immunisation health status, when it helps to increase the likelihood of obtaining accurate information and minimises bias in responses to questions that would normally reflect the

respondents reaction to an interviewer (Polit & Hungler 1993; Kumar 1996). Further, Levin and Fox (1997) cite a precise advantage of the survey over other forms of research in that it does not involve experimental manipulation of variables and therefore suits the quantitative methodology of the study being undertaken. The two self administered and confidential survey instruments that were utilised for this study were based upon a similar study in 1996 by Thomson, Kennedy and Thompson involving registered child care centres in Victoria and replicated their methods and their questionnaires (Thomson et al. 1998).

3.4 REPLICATION DECISION

The decision to replicate a previous study method was undertaken because of a conscious decision by the researcher to evaluate similar research issues, albeit in a different geographical location. The original study had been conducted in 1996 (Thompson & Kennedy 1998; Thomson, et al. 1998) and it specifically examined Victorian child care workers and immunisation issues relating to hepatitis A and B, rubella and *haemophilus influenzae* type b. However, this Bundaberg study set out intentionally to examine only issues that related to hepatitis A and B immunisation of child care workers in long day care centres.

The investigator was particularly interested in finding out if a study in the Bundaberg area using the same methods would produce similar results as the previous study (Thompson & Kennedy 1998; Thomson et al. 1998). Two different sources, (Polit & Hungler 1993; Neuman 1997) critique previous research studies by stating that findings from a particular piece of research are regarded as tentative unless verified. They affirm that replication of the same thing with an expectation of the same result is good quantitative measurement. Replication in the context of this current study, refers to repeating the original research study using the same methods to see if the

same findings result (Polit & Hungler 1993; Weinbach & Grinnell 1995; Neuman 1997).

The decision to use replicated instruments was also made for a number of additional reasons. Re-use of the Thomson, Kennedy and Thompson instruments was considered very appropriate to the Bundaberg study population because the study setting was similar (long day care centres) and successfully utilised on a much larger sample of 113 random centres from 800 registered centres in the state of Victoria. The survey instruments had previously produced high response rates of 85 per cent (95/113) from centres and 74 per cent (607/823) from workers. The demographics of the present study were also expected to be very similar to the Thomson, Kennedy and Thompson findings [that is, predominantly female, a median age of 30 years, Australian born, approximately 40 per cent working part time or casual and with more than 60 per cent of the staff changing nappies on a daily basis] (Thomson et al. 1998). The Bundaberg study would also provide an excellent opportunity to validate questions previously used in the 1996 Victorian study.

Polit and Hungler (1993) contend that research results can almost never be justified on the basis of a single isolated study, so further repetition of research procedures and findings by a second or additional investigations enhances the validity of the original study's findings. The more the results of a study such as the Thomson, Kennedy and Thompson 1996 study are replicated, the greater the confidence there will be that the results are real and not due to a fluke or by chance (Runyon, Haber, Pittenger & Coleman 1996).

Beaglehole, Bonita and Kjellstrom (1993) suggest that consistency of results is also demonstrated by several studies giving the same results. Neuman (1997) describes this type of verification of previous research as an honesty check on the system of knowledge, because you are repeatedly testing explanations against hard objective facts. Bennett (1990) is also

supportive of replication, stating that it adds depth and substance in an area, as well as increasing the confidence in the original findings.

Neuman (1997) further refers to replication as the principle of heteogeneous observation, that is, all things being equal, many diverse observations provide stronger evidence than one, as logically, different researchers are unlikely to make the same errors. However, if the same findings cannot be reproduced in the Bundaberg study, then questions may be raised about the initial findings or original causal relationship(s).

If the same findings are reproduced through replication in the current study, the researcher will have provided repeated evidence in support of what was supposed fact about child care workers and hepatitis A issues, and thereby verify the reliability of the original research findings (Thomson et al. 1998). Additionally, conducting the Bundaberg study by committing to replicating previous methods will further increase confidence in those initial procedures that identified where relationships between variables were found to exist.

3.5 ETHICAL ISSUES

Ethical clearance for the present study followed the guidelines of the Central Queensland University's R2.1 Code of Conduct for Research. Access to the original Thomson, Kennedy and Thompson questionnaires had been granted to the researcher by personal e-mail on 07 January 1999 from Ms S. C. Thompson. Participation in the study did not endanger any participant, either physically or emotionally, as negative sequelae did not arise during or as a consequence of the research. There was no payment or inducement offered for participation in the study survey.

3.6 DATA SECURITY

Only the researcher and the data entry specialist, had access to the computer files. Access was achieved via a password-only computer security system at the researcher's residence. Questionnaires and other associated data including paper records and copies of computer files remained securely stored in a locked facility at all times. As all surveys were coded prior to distribution, the identity of individual respondents could not be linked with any of the specific responses. This coding system did however, make reference to the centre under survey using a three letter code on both the envelope and the survey document. Pre-coded questions were not used in the research instruments. On completion of the statistical data analysis, the survey response documents were destroyed.

3.7 RESEARCH INSTRUMENT

For the current study, self completion questionnaires were utilised. These survey instruments with recognised scales of measurement, were a replication of instruments used successfully by Thomson, Kennedy and Thompson in their 1996 research of Victorian centres (Thompson & Kennedy 1998; Thomson et al.1998).

The scales of measurement utilised for both research instruments included a mixture of all four recognised levels of measurement for variables; that is, nominal, ordinal, interval and ratio (Groninger 1990; Rea & Parker 1997; Jordan, Ong & Croft 1998; Kuzma 1998). These scales are important because each variable must be capable of being measured by numbers that meaningfully reflect the dependent variable (Groninger 1990). Therefore, to operationalise this study's variables distinct measurement scales or levels were assigned. This enabled the correct statistical analysis to be undertaken for studying relationships between variables; for example - nominal and nominal ordered - chi-square test; nominal ordered and nominal ordered -

chi-square test; dichotomous and nominal - chi-square (if small sample, improve fit using correction) (Bland 1995).

As the study was primarily concerned with extending the earlier research of Thomson and others (1998) only in relation to hepatitis A and B staff immunisation issues, the self reported immunisation status of rubella and *haemophilus influenzae* type b for workers in the Bundaberg sample was not evaluated. This meant the removal of a total of four questions from the worker questionnaire, whilst from the director instrument, only one question relating to rubella issues was omitted. Copies of both modified survey instruments are included at Appendix 1 and Appendix 2 respectively.

To adequately reflect the focus of this particular research, minor modifications were required to the original instruments. For example, for child care workers the question of worker qualifications was amended slightly to include the Queensland recognised Certificate III in Child Care and Education CNO323 (TAFE) qualification in the area of child care training. This certificate (Australian Qualification Framework [AQF] Level 3), provides good entry to the profession and allows later articulation into Diploma level qualifications (Queensland Community Infonet http://www.families.qld.gov.au; Accessed 22 Feb 1999).

Worker ages were grouped into age ranges to provide five multiple choices as opposed to the respondent writing his or her age in years as utilised in the original Thomson et al. study (Thompson & Kennedy 1998; Thomson et al. 1998). This was done to enable easier encoding during analysis (Polit & Hungler 1995). The wording of the questions on risk perception for workers were modified with more contemporary wording of: 'someone not working in child care' instead of: 'an ordinary person in the community'. The question of frequency of workers changing nappies was enhanced with an additional request for respondents to: 'describe the nappy changing

procedure used'. This was added to gauge if workers across the sample followed standardised procedures.

In relation to addition of new questions, four questions were developed and added to the child care worker questionnaire. A multiple choice question assessing worker perception of their general health was considered to be appropriate. It was included amongst the first group of questions on demographic data because these questions are easily answered by informants and serve as a warm - up, leading into the next section (Polgar & Thomas 1995). Its aim was to stimulate an interest and a willingness to share information early in the questionnaire, in the likely event respondents were sensitive to replying about workplace issues in child care settings. Secondly, the self reported indication of any or all of the symptoms associated with hepatitis A was included as a closed question. Its purpose was to provide factual information about workers recognition of hepatitis A infection symptoms.

Two questions assessing risk perception were added, the first addressing: 'the risk from catching hepatitis A from the children in your care' and the other to gauge: 'the risk from catching hepatitis B from infected persons in a child care setting'. These two questions, both in nominal, dichotomous scales, were included to assess the level of worker awareness of risk of contracting hepatitis A and B viruses from infected children in their care. The NHMRC (1997, 2000) and evidence from other studies (Hadler & McFarland 1986; Mullin & Stehr-Green 1991) confirm that infected children provide ready routes of transmission to both adults and other children in child care settings and therefore, the awareness levels of this sample were considered an important issue to investigate.

Some minor changes were made to the question sequencing in the demographics area of the instrument to make the opening questions more user friendly and easy to answer. The inclusion of new headings, to more

effectively define the section discussing hepatitis A from the section discussing hepatitis B and some additional wording in the text for the symptoms of hepatitis B concluded modifications to the worker questionnaire.

For the directors' survey instrument, only two new questions were included. The first, a multiple choice question with new age ranges in years and months was incorporated for easier encoding of the question: 'How many children are usually in each age group when the centre is operating at peak capacity?', replacing a request for a response to insert: 'the age ranges of the youngest to the oldest child' (Polgar & Thomas 1995). These ranges were later modified to months for analysis purposes. The second, sought information about a number of established procedures used by staff associated with caring for toddlers who are not toilet trained, to confirm if standardised procedures were adopted and used across all surveyed LDC centres.

Changes to the questions relating to the centre's location in the region and the categorisation of each centre by type within Queensland were carried out to reflect this study's locale in the Bundaberg region. The incorporation of two new section headings to group questions more effectively within the document and to assist respondents to navigate the questionnaire, finalised changes to the directors' instrument.

Each instrument contained a range of both open and closed questions. Neuman (1997) advises that an instrument with a balanced mix of open-ended and closed-ended questions offers a change of pace for the reader, provides a smooth flow from one section or topic within the layout to another and reduces the disadvantages of using only one particular question format. Baum (1998) states that one of the strengths of open-ended questions is that respondents can reply in their own words and at their convenience. These type of questions are useful for opinions and attitudes. On the other hand, Kumar (1996) advises that closed-ended questions are extremely useful for

factual information and because the possible responses are already categorised, are easy to analyse. The researcher was seeking opinions from respondents about a range of immunisation issues as well as factual information from workers themselves, that would be easy to analyse.

In addition, two different texts (Polit & Hungler 1993; Polgar & Thomas 1995) state that while open-ended and closed-ended questions have particular strengths and weaknesses for researchers and respondents alike, a balanced mix of each type coupled with meaningful sequencing of the questions encourages co-operation and candor from the respondent. The closed questions in the survey documents for this study comprised a mix of multiple choice and dichotomous questions.

A total of 28 questions (eight pages) comprised the worker questionnaire, while the directors' questionnaire contained 23 questions (seven pages) in length. Almost all had been successfully used in the original 1996 study, previously validated and proven to be reliable at that time (Thompson & Kennedy 1998; Thomson et al. 1998). In this replicated study, successful re-use of survey documents with a mixture of open and closed question types also meant the likelihood reinforcing the validity and reliability of the original questionnaire construction (Neuman 1997; Thomson et al. 1998).

As utilised in the Thomson et al. (1998) research instruments, a number of questions sought information about risk perception and were presented on a Likert scale (Polit & Hungler 1993; Jordan et al. 1998). Rea and Parker (1997) state that scaled responses (Likert) work particularly well in the context of seeking to elicit attitudinal information about one specific subject matter, in this case worker risk belief. For example, for hepatitis A and hepatitis B, child care workers were asked, prior to receiving the questionnaire, whether they perceived the risk of a non-immunised child care worker catching the disease compared to someone not working in child care

and asked to rate their risk on a five point scale (much more likely, more likely, about the same, less likely, much less likely). This question follows the conventional five point Likert scale (Polgar & Thomas 1995).

On the other hand, child care directors were asked to record responses to questions on the importance of staff being immunised against hepatitis A and hepatitis B on four point scales (not at all important, somewhat important, important, and very important); that is, four point forced choice type questions. This format forces the respondent to give either a positive or a negative response to this particular type of question, thus avoiding the non-committal neutral response (Polgar & Thomas 1995). For the purpose of statistical analysis using '2 x 2' contingency tables, in each case these four responses were later merged to two variables for hypothesis testing. That is, whether any importance was positively attached to staff immunisation or none whatsoever.

Both research instruments for the current study retained the same filter or screening questions (Rea & Parker 1997) that were used to effect in the Thomson et al. (1998) research. In the present study, the response to the first part of a four part question determines which of the three remaining sub-questions the vaccinated respondent next receives. For example, the question: 'Have you been vaccinated against hepatitis A?' screened out the 'No' respondent, with the 'Yes' respondent progressing to the succeeding sub-questions of: 'Why?', 'Who arranged?' and 'Who paid?'. On the basis of the 'No' response, the non-vaccinated respondent is required to skip onto the next theme question. These types of questions are useful because they select who responds to the succeeding series of sub-questions and for whom the questions will be relevant. In this case, the relevant respondent becomes the vaccinated worker, not just any worker. To improve the document's recognition and to assist in the collation of the data, the centre directors' questionnaire was given a mauve coloured cover sheet while the child care

worker questionnaire included a green coloured cover sheet on the document.

Notwithstanding the argument that the two instruments had been successfully used previously and had undergone some minor modifications that could conceivably effect their reliability and validity, their use in the revised form was deemed to be acceptable and the changes justified for the study population in Bundaberg. Importantly, assessment of all these changes had been conducted as part of the pilot study and their feasibility was confirmed during this pre-test outside the project target area.

3.8 PILOT STUDY

Both seven page questionnaires including consent document, covering letter and study procedures were tested in a pilot study using a random sample of four child care centres in Maryborough, Queensland. The city of Maryborough was chosen for the pilot study because it was outside the study target population of the Bundaberg region and reasonably close, being within one day's mailing time of the researcher. The pilot study was used to assess the adequacy of instructions to respondents, to identify any problems in the questionnaire design following modifications such as format, the length and wording of the questions and finally to gauge if the expected data would be generated. Several authors (Polit & Hungler 1993; Jordan et al. 1998; Kumar 1996; Neuman 1997) support pilot tests or studies as an important facet of planning and conducting social research because it provides the researcher with information in relation to refining his or her project as well as testing the measurement tools and procedures, before they cause major disruption to the main survey. For the present study, it ensured that the researcher got answers to the questions and that the respondents were willing and able to give those answers (Jordan et al. 1998).

Eight self administered questionnaires were dispatched by hand in May, 1999, one of each of the director questionnaires to four random centre

directors along with one of each of the worker questionnaires for a worker at each of the same child care centres. Of these, six (75%) of the pilot surveys were returned completed within three weeks with only one follow-up, three from centre directors and three from workers. Two (25%) of the pilot survey documents were not returned.

Responses from the pre-test indicated the need to make minor changes to the directors' questionnaire. The numeric values of the age ranges in the question concerning the children's age groups when operating at peak capacity were adjusted and an additional question calling for an opinion by directors if the numbers of children wearing nappies were considered excessive under current staffing arrangements, was included following written comment from two directors. No further changes were effected to the worker survey document. Examples of the covering letter, project details and consent document are included at Appendix 3.

3.9 STUDY SAMPLE

Three urbanised communities within the Bundaberg region of Queensland were chosen as the reference population, because all the long day care (LDC) centres in the target area were confined to these three particular locations. They comprised the townships of Gin Gin and Bargara and the city of Bundaberg, as shown in Map 1.1 on page 9. These towns were within the defined local government areas of Kolan, Burnett and Bundaberg respectively. The site for this study in the Bundaberg region was also chosen because it was reasonably convenient for the researcher and given the close proximity of the child care centres to one another, presented an opportunity for easier administration of survey mail-outs and for site visits to each of the centres if required.

The source population of child care centres for this study had been drawn from a list of all registered, operational child care centres in the

Bundaberg region and stratified by license type. This list was provided by the Queensland Department of Families, Youth and Community Care (DFYCC) (Queensland Community Infonet http://www.families.qld.gov.au; Accessed 25Mar 1999). Listings of this type are often referred to as being the source or accessible population, because they are the actual population of direct concern to the researcher as a pool of subjects (Polit & Hungler 1993; Christie et al. 1997). For the present study it was assumed that the registration list of licensed centres would not only be accurate, up to date and representative of child care centres in the wider Bundaberg region, but would provide the complete sampling frame. As all 15 LDC centres listed in the source population were included in the study, the sample was therefore representative of those regional child care workers, the reference population.

The study participants selected were child care workers and child care centre directors employed at all local licensed long day care centres. For this researcher, the sample of direct concern comprised the staff at LDC centres, because they were the actual people from whom information and data was to be obtained. As everyone distributed in the current study was not going to consent to take part, the sample for the study really consisted of the responders who completed the questionnaire. Therefore, it was the workers at each of these LDC centres as respondents that constituted the selected survey sample for the study.

The LDC centres of the wider region became the population about which the results of the current study were to be interpreted. Further, Christie et al. (1997) advise that while quantitative inferences can be made from the sample to the source population, problems such as providing a reasonable estimate of circumstances arise when inferences about the reference population are made from data collected in the sample. However, in the current study, the researcher intends to confine inferences to the source population.

In addition, the sample's representativeness and consistency were further enhanced because it was geographically well defined within specific local government areas. The questionnaire distribution and collection process also had the potential for a high response from this particular child care community. These indications were supported by discussions with the Director, Central Public Health Unit Network at Rockhampton, Queensland during the preliminary stages of the study (Taylor, R. 1998, pers. comm., 29 May). Staff at LDC centres had also indicated a willingness to participate in the survey to the investigator during the initial pre-survey telephone phase.

One of the centres in the source population however, was in fact a government licensed family day care centre. Despite this, it was included in the study because it was within the study area, there was no other day care centre servicing that particular urbanised community, it was easily accessible for data collection, staff had indicated a willingness to participate and share the necessary information and the centre provided identical functional services as other LDC centres. Children at this centre ranged in age from birth upwards and based on the preceding criteria, the data from workers at this centre was considered appropriate and included for analysis.

The two confidential questionnaires were self-administered at each centre, during the period July to September 1999. The first document, designated for child care workers, was targeted at those individuals broadly grouped as 'child care workers' and having direct contact with children. These workers included directors, coordinators, qualified child care workers, assistant child care workers (partially qualified), students and administration staff. They comprised those job classifications that have the potential to be occupationally exposed to hepatitis A virus risks during a normal working day in long day care settings. Support staff such as cleaners and gardeners were also included because it was likely that they too could be susceptible to the risk of exposure to hepatitis A virus during the course of their daily duties. Directors (and coordinators) were surveyed with a second

questionnaire about specific management characteristics at each centre such as management structure, licensing, record keeping, policy and procedures implementation.

All centres were contacted beforehand by telephone on two occasions. The first contact was to establish an initial level of interest, a verbal agreement in principal to participate in the study and to establish the exact license type of each centre. Directors were again contacted immediately prior to the mail out, to re-confirm participation and explain the study rationale and methodology. A total of 176 worker questionnaires and 15 director questionnaires were distributed.

All participants in the study were expected to be employed on a full time, part time or casual basis at each of the participating centres. Participants were asked to sign a consent form, and complete and return their completed questionnaire in a sealed, postage paid, reply envelope to the researcher.

3.10 DATA COLLECTION

In July 1999, self administered questionnaires, covering letters, and informed consent forms with reply paid envelopes were mailed to each long day care centre in the sample. Each centre received a separate questionnaire for its director and a child care worker questionnaire for each employed worker. Each questionnaire had been coded and numbered with a combination three letter, two digit code so that non-responders could be identified. This also enabled responses from each centre to be linked. The number of surveys to be mailed to each centre had previously been identified during the initial pre-survey telephone contact phase between the researcher and each centre's management.

Centres with non-responders received a telephone reminder after 14 working days. Non-responders to the first telephone reminder were then

contacted again by telephone at day 21 and day 28 respectively, and finally visited directly by the investigator during the sixth week, in an endeavour to improve response rates. Other forms of maximising response rates such as monetary incentives used successfully by Bond, Nolan and Lester (1999) or primer postcard reminders recommended by Pirotta, Gunn, Farish and Karabatsos (1999) were not required, as the relevant number of survey responses were returned within six weeks of the initial mail out. There were cases of 'nil response' to the overall questionnaire but the directors chose in these circumstances to actually return the whole document to the researcher out of courtesy and with the hope they could be re-used. There were no partial, non-response situations (ABS 1993).

The management at one centre, on advice from the facility's owner, chose not to distribute the questionnaires to any of its staff and therefore did not participate in the study. However, verbal agreement to participate had been given when initial contact was conducted. These survey documents were not returned to the researcher. This subsequently reduced the number of participating centres to 14. Within a month of the conclusion of the collection phase, a 'thank you' note from the researcher was mailed to the management and staff at all centres.

3.11 DATA HANDLING AND CLEANING

On return, each completed questionnaire was edited by checking for completeness and to minimise as far as possible, errors, mis-classifications, duplications and any omissions in the information obtained from the respondents (Kumar 1996). A coding schedule was then assigned by placing numerical values to the answers from respondents (Kumar, 1996). This entailed creating a code sheet, whereby numbers were assigned to sets of responses for each question in preparation for direct data entry. This coding procedure followed such conventions as: '1 for Yes', '2 for No', '3 for Don't Know', '1 for Female' and '2 for Male' and for multiple choice questions, if

the question had four responses then those four responses were given the codes: '1, 2,3 and 4' (Polit & Hungler 1993; Kumar 1996).

Common themes were identified in the open-ended questions, the themes named and where possible responses classified under those themes. A number of completed instruments then were selected at random and responses recorded to check for any discrepancies in the coding process, as advocated by Kumar (1996). Respondents were also invited to make comment about any issue raised by the questionnaire. These comments were reviewed for relevance and significance and where necessary, clarified by a follow-up telephone call. The data was then entered into a computer data file using *Excel* spreadsheets.

Code cleaning of the data was conducted by checking the categories of all variables for errors in the assigned codes, written ambiguous answers, sequencing of filter instructions, looking for any impossible combinations or for any incorrect responses in the appropriate fields on the spreadsheets (for example, 02.4 instead of 2.40), after the data had been entered (Neuman 1997). Range editing was conducted to check that no code outside the valid range had been entered (ABS 1993).

The final clerical editing process involved finding a number of randomly selected questionnaires from the identification number on the spreadsheet printout and correcting for any errors between questionnaire and spreadsheet file. No errors were detected.

As the questionnaires acted as the prime medium for transfer of data to the spreadsheets, the need for a separate data input form was removed, thereby minimising transcription errors during that stage (ABS 1993). Tables of logistically related variables were used to look for data entry errors and outlying data points. These were then corrected by reference back to the questionnaires.

3.12 STATISTICAL ANALYSIS

The statistical methods detailed in this study were chosen to suit the types of responses for the survey design, to replicate similar tests employed by Thomson, Kennedy and Thompson in their study and to elicit the data required to answer the research questions (Thomson et al. 1998). Other statistical analysis methods were investigated for suitability but were considered inappropriate for this particular study application.

Descriptive statistics were generated using the *Excel* program to analyse all collected data. A standard template was developed for both survey documents to facilitate direct data entry. Statistical analysis was carried out by individual centre and total centre summaries for the worker questionnaires and a total centre summary analysis for directors questionnaires.

As a consequence of the relatively small sample size the statistical analysis that was conducted on the data was restricted to the following. Basic descriptive statistical analysis such as means, percentages and standard deviations were performed for the appropriate question responses such as carers demographic data and data specifically dealing with the occupational setting, for example hours worked per week (Rea & Parker 1997). In the cases where age ranges were used as question responses, the central value of the range intervals were used for these calculations (Stroud 1987). As a measure of central tendency the arithmetic mean was calculated for all data in ordinal and ratio scale of measurement (Zar 1984; Rea & Parker 1997). Frequency distributions were also used to analyse a range of demographic factors such as the ages of carers, work hours, years in service and the ages of children under care (Freund 1988; Polit & Hungler 1995; Rea & Parker 1997).

Chi-square test for associations were undertaken for survey phenomena variables such as non-immunised workers with workers

awareness of the availability of hepatitis A vaccine and the awareness of recommendations for immunisation by the NHMRC (Zar 1984; Rice 1988; Bland 1995; Rea & Parker 1997; Kanji 1999). The chi-square test, a non-parametric test, is popular for analysis of nominal or ordinal level data and suited this study because of the use of high numbers of questions in nominal or ordered scales. However, whilst less powerful statistically than parametric tests, it is useful for small samples (Weinbach & Grinnell 1995).

This test was repeated for hepatitis B variables. Chi-square test was also utilised to test for any association between hepatitis A immunisation and age of child care workers and also for awareness of the risk of hepatitis A. Once again this was repeated for similar questions on hepatitis B. To present and analyse data from chi-square tests of association, the package *Statistics for Education and Beyond, Release 12, MINITAB Statistical Software* (1997) was used.

For those categorical data situations where the respondent sample size was small and subsequently yielded smaller expected frequencies, or when cells in contingency tables had no observations, consideration of merging of question categories and continuity correction was required. Bland (1995) and Kuzma (1998) state that researchers might decide to combine or merge question categories to eliminate problems of non-conformance associated with the general rule of thumb of Cochran for use in '2 x 2' contingency tables; that each cell of the table should contain an expected frequency (E) of at least five. Runyon et al. (1996) are of the opinion that the chi test is robust enough with smaller frequencies providing correct rejection of the null hypothesis is inferred. Rea and Parker (1997) further counter by arguing that the researcher's goal should be to retain as many of the original question categories as possible and to be mindful of distortion during use of merging of categories.

In the current study, merging was restricted to those four questions, two from each document, that specifically pertained to risk perception and

sought agreement from respondents with either a positively worded statement or negatively worded statement (Polit & Hungler 1993). For example, in the worker questionnaire the two conventional five point Likert type scale questions (17 and 24) were merged to two response formats - more likely and same or less likely - for hypothesis testing by '2 x 2' contingency tables. In the second instance, with the director questionnaire, the four point forced choice Likert type questions (18 and 19) dealing with the director's belief of staff immunisation were merged to two categories also - positive and negative responses - for hypothesis testing by '2 x 2' contingency tables (Polgar & Thomas 1995). No other scoring category or rating was applied to these particular questions during analysis.

The undesirable situation of bias in chi-square calculations for small frequencies in the current study was countered by complying with Cochran's conventional rule of thumb in these circumstances of: '.... no expected frequencies should be less than one and no more than 20% of the expected frequencies should be less than 5.0 ' (Zar 1984, p. 49). Expected frequencies from nominal data collected from director's questionnaires were estimated at less than 10 for responses from some questions. Therefore, a continuity correction factor was applied to '2 x 2' contingency tables for relevant chi-square test of association to reduce researcher mis-interpretation of type II error and improve the fit (Zar 1984; Spiegel 1992; Bland 1995; Rea & Parker 1997; Jordan et al. 1998). Levin and Fox (1997) and Spiegel (1992) also recommend the use of a continuity correction for small expected frequencies in '2 x 2' contingency tables involving degrees of freedom (df) of one, as utilised for this study.

However, Bland (1995), Watson, Billingsley, Croft and Huntsberger (1993) and Jordan et al. (1998) all counter by reminding researchers while continuity correction provides a conservative result increasing the p-value, it does improve probability approximation. Further, they support through implication that it is more advantageous to err on the side of caution

interpreting data from small frequencies by utilisation of continuity correction in such circumstances. This means that in the current study we are testing at a more stringent (that is, lower) significance level than the stated *alpha* (α) (Zar 1984).

In the present study, results of chi-square tests of association are reported in the format used by behavioural sciences and follows the style published in 1994 by the American Psychological Association (Runyon et al. 1996). This format reports degrees of freedom, the number of subjects used in the study and whether the probability level associated with the statistic was greater than or less than the *alpha* (α-level) selected for the study; for example, $\chi^2 (1, n =) = \quad , p < 0.05$.

Cochran's corrected chi-square calculation (Zar 1984) provides better results than does Yates-corrected chi-square or usual non-corrected chi-square calculations. For the present study, Cochran's corrected chi-square statistic was therefore chosen for '2 x 2' contingency tables to test for association between phenomena variables from the director's questionnaires with small samples ($n \leq 15$).

As a large portion of the data collected in the current study was to be dichotomous, nominal scale data, an index of the magnitude of relationships between variables under examination would be considered useful (Zar 1984; Groninger 1990). Cramer's *phi coefficent* (ϕ_2) was adopted for the study because it can range from minus one to plus one (-1 to +1), expressing not only direction but also strength of association between variables (Zar 1984). Additionally, both Zar (1984) and Groninger (1990) report favourable use of Cramer's *phi* (ϕ_2) for '2 x 2' contingency table situations.

To place a strength of association between any two variables under examination relative to a baseline level of occurrence, a measure of relative

risk (RR) was required (Beaglehole et al. 1993; Jordan et al. 1998; Kuzma 1998). In addition, Kuzma (1998) also states that relative risk or as it is sometimes known risk ratio, is easy to calculate and interpret, and is widely used as a quantitative measure of risk in epidemiological studies. Beaglehole et al. (1993) further posit that relative risk greater than two could be considered strong, dependent upon sample size and confidence principles of the study. In the current study, relative risk was measured for those nominal variables from workers questionnaires where chi-square test of association confirmed association.

Throughout this present study, the stated null hypothesis for '2 x 2' contingency chi-square tests was 'no difference' (that is, independent) between frequencies of variables under examination. To minimise the risk of type II error in the current study, the researcher chose the recognised conventional level of significance for statistical decision making of *alpha* (α = 0.05) (Polit & Hungler 1993; Bland 1995). Straight discrete data comparison and cross tabulation of data was used to draw conclusions in other areas such as worker qualifications, frequency of nappy changing and the perceptions of risk between hepatitis A and hepatitis B.

CHAPTER 4

RESULTS

From the survey of long day care centres in the Bundaberg region, the following results were obtained using two confidential, postal documents.

4.1 CHILD CARE WORKER RESPONSES

Of the long day care centres circulated, a total of 102 workers responded (n=102). Thus, with 102 questionnaires available for analysis, this survey yielded a response rate of 62.5 % (102/163). A summary of all responses to the survey of long day care centres by location in the Bundaberg region is illustrated at Table 4.1. As shown in Table 4.1, the completed and returned questionnaires from participating centres comprised 83 from Bundaberg, 14 from Bargara and five from Gin Gin. Non-response rate was 37.4% (61/163).

Table 4.1: Summary of responses to the survey of long day care centres by location

LOCATIONS / QUESTIONNAIRE DISTRIBUTION		BUNDABERG		BARGARA		GIN GIN	
		Count	%	Count	%	Count	%
Completed - returned	102	83	62	14	73.7	5	50
No response - returned	13	10	7.5	3	15.8	0	0
No response - not returned	48	41	30.5	2	10.5	5	50
TOTAL	**163**	**134**	**100%**	**19**	**100%**	**10**	**100%**

Total distributed: 163; total responded: 102; response rate: 62.5%

While some non-responses were attributed to minor staffing changes, others were taken to be genuine such as one centre electing not to participate. Follow up to determine why they chose not to respond would have been useful to avoid over-estimation of the situation.

4.2 CHILD CARE WORKER DEMOGRAPHICS

Respondent workers were predominantly female at 96.1% (98/102) of the sample, mostly Australian born (91.2%; [93/102]) and with a mean age for female workers of 29.6 years (median 29.2 years). The four male respondent workers had a mean age of 32.6 years. A further 3.9% (4/102) of the workers were born in New Zealand. Two workers were born in the United Kingdom, while another three originated from Italy.

Of female workers, approximately 80% were aged in the range 20 to 44 years, with a median age of 28.5 years. A tabulated summary of all respondents by age group and sex is demonstrated at Table 4.2.1. The majority of child care

Table 4.2.1: Tabulation of all respondents by age group and sex (*n* = 102)

RESPONDENT AGE GROUPS	MALE RESPONDENTS (*n*=4)		FEMALE RESPONDENTS (*n*=98)	
	Count	Row %	Count	Row %
16 – 19	0	0	9	100
20 – 24	1	3.6	27	96.4
25 – 34	1	3.4	28	96.6
35 – 44	2	8.7	21	91.3
45 – over	0	0	12	100
Nil response	0	0	1	100
Total	**4**	**3.9%**	**98**	**96.1%**
Mean age of all workers : 29.75 years				
Median age of all workers : 29.3 years				

workers were qualified (66%; 66/100), with 15% (15/100) unqualified. Contingency table testing using chi-square statistic test for association determined that there was no association between those workers qualified in child care and either their level of awareness of the NHMRC recommendations

for child care workers to be immunised against hepatitis A infection (P-value = 0.468) or self-reported hepatitis A immunisations (P-value = 0.673).

Employment status was reported at 58.8% (60/102) on full time basis, 21.6% (22/102) part time and 19.6% (20/102) casually. Respondents had worked for a mean of 5.08 years (s = 4.21), median 4.0 years, in child care services and usually work for a mean of 31.38 hours (s = 9.42) per week. No association was established between these employment categories and the self-reported levels of hepatitis A immunisation in workers (P-value = 0.178). Table 4.2.2 illustrates summarised response data in relation to child care worker demographics.

Table 4.2.2: Summarised response data for child care worker questionnaire – Questions1 to 9.

CHILD CARE WORKER DEMOGRAPHICS									
Question Number		1	2	3	4	5	6	7	8	9
Question Type		**Category of Worker**	**Years in service**	**Age Group**	**Sex**	**Country of Birth**	**Health Status**	**Years at centre**	**F/T, P/T etc**	**Hours worked**
Response Codes		**1 - 3**	**Years**	**1 - 5**	**F/M**	**1,2,3,4**	**1 - 5**	**Years**	**1 - 3**	**Hours / week**
Raw Data										
Average			5.08							31.38
Response Counts	1	66		9	98	93	51		60	
	2	15		28	4	4	34		22	
	3	19		29	0	2	9		20	
	4	0		23	0	3	5		0	
	5	0		12	0	0	3		0	
	6	0		0	0	0	0		0	
	7	0		0	0	0	0		0	
	8	0		0	0	0	0		0	
Std Dev			4.21					2.24		9.42
Total Responses		100		101	102	102	102		102	
%'s	1	66.0		8.9	96.1	91.2	50.0		58.8	
	2	15.0		27.7	3.9	3.9	33.3		21.6	
	3	19.0		28.7	0.0	2.0	8.8		19.6	
	4	0.0		22.8	0.0	2.9	4.9		0.0	
	5	0.0		11.9	0.0	0.0	2.9		0.0	
	6	0.0		0.0	0.0	0.0	0.0		0.0	
	7	0.0		0.0	0.0	0.0	0.0		0.0	
	8	0.0		0.0	0.0	0.0	0.0		0.0	
Nil Response		2.0		1.0	0.0	0.0	0.0		0.0	

Daily changing of children's nappies was reported by 56 workers (54.9%). A further 16 (15.7%) workers were involved changing children's nappies on a weekly basis. Chi-test of association did not attribute any association between reported frequency of nappy changes and the reported levels of hepatitis A immunisation amongst those centre workers (P-value = 0.268).

Table 4.2.3: Summary of the usual age groups of children under care by workers

USUAL AGE GROUP of CHILDREN	CHILD CARE WORKERS (*n* = 102)	
Age groups	*Count*	*Survey % Ages*
< 2 years	23	22.8
2 – 3 years	17	16.8
3 years +	27	26.7
Mixed 0 – 5 years	24	23.8
Other	10	9.9
Nil responses	1	0
TOTALS	**102**	**100%**
Mean age : 2.56 years		

In terms of work practice for all surveyed child care settings, the age groups of children which respondents reported they usually worked with is summarised at Table 4.2.3. The mean age of children in care was 2.56 years. Summarised response data from workers on their child care centre setting is presented at Table 4.2.4 on page 92. This table displays responses to the questions that pertain specifically to the nappy changing environment of the child care workers' workplace.

Table 4.2.4: Summarised response data for child care worker questionnaire – Questions 10 to 13.

CHILD CARE CENTRE SETTING							
Question Number		10	11	12 (I)	12 (2)	13 (1)	13 (2)
Question Type		**Usual Age Group**	**Nappy Carer**	**Nappy Change**	**Describe**	**Asked If Immunised at start**	**Employer Pay**
Response Codes		**1 - 5**	**1 - 5**	**1 - 5**		**1 - 3**	**1 - 3**
Raw Data							
Average							
Response	1	23	60	56		21	4
Counts	2	17	13	16		68	45
	3	27	20	19		12	6
	4	24	4	7		0	0
	5	10	5	4		0	0
	6	0	0	0		0	0
	7	0	0	0		0	0
	8	0	0	0		0	0
Std Dev							
Total Responses		101	102	102		101	55
%'s	1	22.8	58.8	54.9		20.8	7.3
	2	16.8	12.7	15.7		67.3	81.8
	3	26.7	19.6	18.6		11.9	10.9
	4	23.8	3.9	6.9		0.0	0.0
	5	9.9	4.9	3.9		0.0	0.0
	6	0.0	0.0	0.0		0.0	0.0
	7	0.0	0.0	0.0		0.0	0.0
	8	0.0	0.0	0.0		0.0	0.0
Nil Response		1.0	0.0	0.0		1.0	46.1

4.3 IMMUNISATION STATUS and GENERAL HEALTH

Only 20.8% (21/101) of child care workers reported they had been asked about immunisation status at commencement of work with their current employer, but tests for association determined that there was a relationship with worker immunisation for protection against hepatitis A infection (P-value = 0.034).

4.4 HEPATITIS A SURVEY DATA

A total of 34.7% (35/101) stated they had been vaccinated against hepatitis A, with 64 workers not immunised and two workers unsure. The recognition of symptoms that could be attributed to hepatitis A infection was reported by 23.5% (24/102) of child care workers. Chi-test for association revealed no association with the uptake of the vaccine by workers (P-value = 0.087). There was also no association between those who had previously suffered from the illness of hepatitis A and the number of self-reported hepatitis A immunisations (P-value > 0.05; 2 cell counts <5.0).

Chi-test calculations determined that there was association between hepatitis A immunised workers and their perception of the risks of catching hepatitis A from children in their care (P-value = 0.003). Table 4.4.1 illustrates summarised hepatitis A survey response data from child care workers.

Chi-square test of association between worker's perception of risk for non-immunised workers of contracting hepatitis A compared with someone not working in child care and with their immunisation for hepatitis A determined no association (P-value = 0.278). Similarly, the perception of hepatitis B risks also had no statistical association with reported hepatitis B immunisation levels of workers (P-value = 0.681). The column graph displaying a comparison of the percentage results for these two questions is presented at Figure 4.4.2 on page 95.

HEPATITIS A RESPONSES

Survey Questions		14	15	16	17	18	19	20	21 (1)	21 (2)	21 (3)		21 (4)	
Question Type		**Symptoms**	**Suffered**	**Risk of Hep A**	**Higher Risk of hep A**	**Infected Hep A virus**	**Immun. Available**	**Immun. Rec by NHMRC**	**Vaccinated Hep A**	**Chose Vaccine**	**Vac. Arranged by**	**Comments**	**Paid by whom**	**Why Not Vac.**
Response Codes		**1 - 3**	**1 - 3**	**1 - 3**	**1 - 5**	**1 - 3**	**1,2**	**1,2**	**1 - 3**	**1 - 3**	**1 - 6**		**1 - 3**	**1 - 8**
Raw Data														
Average														
Response	**1**	24	1	78	33	1	95	75	35	3	16		30	0
Counts	**2**	77	97	21	48	93	7	27	64	28	1		5	2
	3	1	4	2	19	8	0	0	2	4	9		0	5
	4	0	0	0	2	0	0	0	0	0	0		0	7
	5	0	0	0	0	0	0	0	0	0	0		0	0
	6	0	0	0	0	0	0	0	0	0	9		0	27
	7	0	0	0	0	0	0	0	0	0	0		0	9
	8	0	0	0	0	0	0	0	0	0	0		0	14
Std Dev		0.44	0.22	0.48	0.76	0.29	0.25	0.44	0.51	0.45	2.04		0.35	1.63
Total		**102**	**102**	**101**	**102**	**102**	**102**	**102**	**101**	**35**	**35**		**35**	**64**
%'s	**1**	23.5	1.0	77.2	32.4	1.0	93.1	73.5	34.7	8.6	45.7		85.7	0.0
	2	75.5	95.1	20.8	47.1	91.2	6.9	26.5	63.4	80.0	2.9		14.3	3.1
	3	1.0	3.9	2.0	18.6	7.8	0.0	0.0	2.0	11.4	25.7		0.0	7.8
	4	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	10.9
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.7		0.0	42.2
	7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	14.1
	8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	21.9
Nil Response		0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	65.7	65.7		65.7	37.3

Table 4.4.1: Summarised response date for child care questionnaire - Questions 14 to 22.

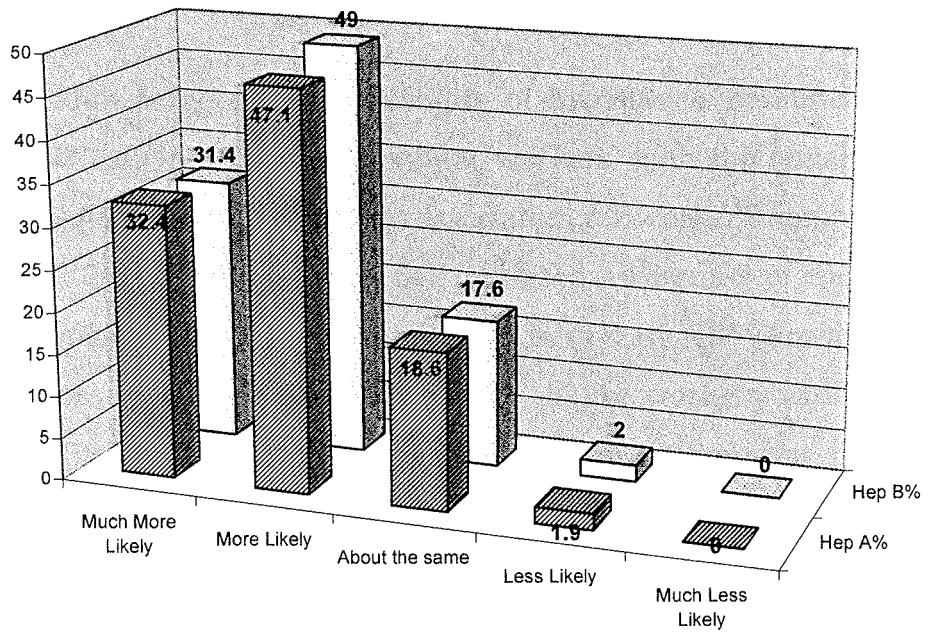


Figure 4.4.2: Column graph comparing the perceived risk of non-immunised child care workers contracting either hepatitis A or B disease with someone not working in child care.

In the current study, chi-square test of association revealed that those workers who believed that hepatitis A infection risks were greater for them than for other industry workers was associated with those workers who also believed that hepatitis B infection risks were greater for them than workers from other industries (P-value = 0.000). This chi-square test is tabulated at Table 4.4.3.

Table 4.4.3: Summarised chi–square test of association of worker risk perceptions of hepatitis A with risk perceptions of hepatitis B over other industry workers.

ASSOCIATION VARIABLES	PERCEPTION OF RISK OF HEPATITIS B OVER OTHER INDUSTRY WORKERS		
	df	χ^2 stat	P–value
PERCEPTION OF RISK OF HEPATITIS A OVER OTHER INDUSTRY WORKERS	1	37.151	< 0.001

While knowledge of the availability of hepatitis A immunisation was reported by 93.1% (95/102) of respondent workers, with the remaining 6.9% unaware, chi-square test suggested no association for worker immunisation (P-value = 0.042; 2 cell counts < 5.0). Self reported awareness of the NHMRC recommendations for hepatitis A immunisation of staff who care for children wearing nappies was found to be 73.5% (75/102) of workers, while 26.5% of workers (27/102) reported to be unaware. An association was determined between this level of awareness of NHMRC guidelines and hepatitis A immunised workers (P-value = 0.013).

Undertaking chi-test of association revealed that age was not a determining factor in hepatitis A immunisation levels in this sample (P-value = 0.804). No association was established by chi-square test between the number of workers immunised for hepatitis A and child care workers' risk perception of hepatitis B compared to someone not working in a child care setting (P-value = 0.359). A summarised tabulation of chi-square tests for association between self-reported hepatitis A immunised workers and other phenomena variables is presented at Table 4.4.4 on page 97.

4.5 HEPATITIS B SURVEY DATA

A total of 90.2% (92/102) of respondents reported they were aware of the risks of catching hepatitis B from infected persons in a child care setting, prior to receiving the questionnaire. A total of 98% (100/102) of workers stated that prior to receiving the questionnaire, they were aware of the availability of immunisation against hepatitis B. Chi-square test determined there was no relationship between this level of worker awareness of hepatitis B and a similar level of awareness of hepatitis A immunisation availability (chi-square invalid; 2 cell counts < 5.0).

Table 4.4.4 : Summarised chi–square tests of association – numbers of workers immunised for hepatitis A compared with other listed variables.

VARIABLES OF ASSOCIATION	SELF REPORTED HEPATITIS A IMMUNISED WORKERS		
	df	χ^2 stat	P-value
PERCEPTION OF RISK FROM CHILDREN	1	8.636	0.003
AWARENESS OF NHMRC RECOMMENDATIONS	1	6.152	0.013
ASKED STATUS BY EMPLOYER	1	4.519	0.034
IMMUNISED FOR HEPATITIS B	1	26.267	< 0.001

Chi-square test of association between the level of risk perceptions of hepatitis A and that of hepatitis B amongst workers revealed that those workers who had a high perception of the risks of hepatitis A were associated with a perception of similar risks from hepatitis B infection in the child care setting (RR 1.5; P-value = 0.000). A summary of the chi-square test is tabulated at Table 4.5.1 on page 98.

Table 4.5.1: Tabulated chi–square test of association of worker risk perception of hepatitis A with risk perceptions of hepatitis B from children in their care.

ASSOCIATION VARIABLES	PERCEPTION OF RISK OF HEPATITIS B FROM CHILDREN		
	df	χ^2 stat	P - value
PERCEPTION OF RISK OF HEPATITIS A FROM CHILDREN	1	22.883	< 0.001

Previous immunisation against hepatitis B was reported by 63.7% (65/102) of workers. Significantly, those child care workers immunised for hepatitis A were associated with immunisation for hepatitis B (RR 2.14; P-value = 0.000). The summarised response data from workers relating to hepatitis B and training is tabulated at Table 4.5.2 on page 99.

4.6 TRAINING

Courses of training or information sessions relating to any staff immunisation issues were reported to have been attended by 8.9% (9/101) of responding workers. The chi-square test for statistical association did not attribute any association with reported attendance at training or educational awareness sessions with either hepatitis A (P-value = 0.094) or hepatitis B immunisations undertaken by surveyed workers (P-value = 0.149).

4.7 CENTRE MANAGEMENT RESPONSES

For centre management, 14 directors (n=14) responded to their questionnaire specific for directors in a child care setting. The centre directors reported that 64.3% (9/14) of the centres were privately managed, while 35.7% (5/14) were community based.

HEPATITIS B and TRAINING										
Survey Questions		23	24	25	26 (1)	26 (2)	26 (3)		27 (1)	27 (2)	28
Question Type		**Risk of Hep B**	**Risk Higher for Hep B**	**Immun. Avail. Hep B**	**Vaccinated Hep B**	**Blood Test Hep B**	**Why Chose Hep B Vac**	**Comment**	**Immun. Training Issues**	**Training Comments**	**Final Comments**
Response Codes		**1 - 3**	**1 - 5**	**1,2**	**1 - 3**	**1 - 3**	**1 - 3**		**1,2**		
Raw Data											
Average											
Response	**1**	92	32	100	65	30	2		9		
Counts	**2**	8	50	2	36	38	50		92		
	3	2	18	0	1	1	13		0		
	4	0	2	0	0	0	0		0		
	5	0	0	0	0	0	0		0		
	6	0	0	0	0	0	0		0		
	7	0	0	0	0	0	0		0		
	8	0	0	0	0	0	0		0		
Std Dev		0.38	0.75	0.14	0.50	0.52	0.45		0.28		
Total		**102**	**102**	**102**	**102**	**69**	**65**		**101**		
%'s	**1**	90.2	31.4	98.0	63.7	43.5	3.1		8.9		
	2	7.8	49.0	2.0	35.3	55.1	76.9		91.1		
	3	2.0	17.6	0.0	1.0	1.4	20.0		0.0		
	4	0.0	2.0	0.0	0.0	0.0	0.0		0.0		
	5	0.0	0.0	0.0	0.0	0.0	0.0		0.0		
	6	0.0	0.0	0.0	0.0	0.0	0.0		0.0		
	7	0.0	0.0	0.0	0.0	0.0	0.0		0.0		
	8	0.0	0.0	0.0	0.0	0.0	0.0		0.0		
Nil Response		0.0	0.0	0.0	0.0	32.4	36.3		1.0		

Table 4.5.2: Summarised response data for child care questionnaire - Questions 23 to 28.

4.8 CENTRE LICENSING

Centres surveyed were licensed for place numbers ranging from 38 to 75 children, with a mean of 63.23 children (s = 13.21). The numbers of full-time children under care at each centre ranged from 4 to 28 children, totalled 164 with a mean of 11.71 children (s = 7.89) and the numbers of children attending on a part-time basis ranging from 41 to 164 children, totalled 1,437 with a mean of 102.64 children (s = 37.40). No significant difference for centre opening hours was indicated between centres, with a mean of 11.43 hours (s = 0.80) within a range of 10 – 12 hours (of opening time) for all centres. Summarised response data for centre structure, operations and licensing is tabulated at Table 4.8.1 on page 101.

4.9 CENTRE OPERATIONAL ARRANGEMENTS

From surveyed centres, a total of 380 children wore nappies each week, average 27.14 children per centre, with a mean percentage of children in nappies per week (all centres, full and part time attendance) determined at 23.62%(s = 9.17). The mean age of youngest children attending was 3.29 months (s = 2.63) and the mean age of oldest children was established at 7.63 years (91.64 months; s = 36.69). Tabulated average number of children per age category in care at peak capacity at each centre is shown at Table 4.9.1.

Table 4.9.1: Tabulated average number of children per age category in care at peak capacity at each centre.

AGE CATEGORIES (months)	1.5 to 15	15 to 30	30 to 42	42 to 60
AVERAGE NUMBER of CHILDREN (in care at peak capacity)	8.42	11.00	18.7	25.08

Mean age of youngest children = 3.29 months
Mean age of oldest children = 7.63 years
Estimate of mean age of children all age groups = 36.27 months

CENTRE STRUCTURE, OPERATIONS & LICENSING

Survey Questions		1	1 (a)	2 (i)	2 (ii)	2 (ii) cont	3	4	5	6	7	8		9	
Question Type		How Managed?	Comments	Sponsor	Who is Sponsor	Other Comments	Centre Location	Category	Days per week open	Hours per day open Hrs	Places Licenced # Places	Children cared		Range of ages (months)	
	Codes	1 - 3		1 - 2	1 - 6		1-4	1-7	1-3			F/t	P/t	Youngest	Oldest
Centres	1	2		2			2	1	1	12	75	4	122	6	144
	2	1		2			1	1	1	10	44	9	79	3	68
	3	2		2			1	1	1	11	58	12	130	1.5	66
	4	2		2			1	1	1	12	75	22	164	4	69
	5	2		2			1	1	1	10.5	58	10	126	4	66
	6	1		2			1	1	1	12	75	9	126	2	90
	7	1		1	6	Local Gov Council	4	2	2	12		9	41	0	180
	8	2		2			1	1	1	12	65	5	50	2	72
	9	2		2			1	1	1	12	65	5	77	11	132
	10	1		1	5	YMCA	1	1	1	10.5	44	5	83	2.5	60
	11	2		2			1	1	1	12	75	28	137	1.5	60
	12	2		2			1	1	1	12	75	9	140	2	126
	13	1		1	5	YMCA	1	1	1	10	38	28	50	1.5	66
	14	2		2			1		1	12	75	9	112	5	84
Average										11.43	63.23	11.71	102.64	3.29	91.64
Response	1	5		3	0		12	12	13						
Counts	2	9		11	0		1	1	1						
	3	0		0	0		0	0	0						
	4	0		0	0		1	0	0						
	5	0		0	2		0	0	0						
	6	0		0	1		0	0	0						
	7	0		0	0		0	0	0						
	8	0		0	0		0	0	0						
Std Dev		N/A			N/A					0.80	13.21	7.89	37.40	2.63	36.69
Total Responses		14		14	3		14	13	14						
% of Resp	1	35.7		21.4	0.0		85.7	92.3	92.9						
	2	64.3		78.6	0.0		7.1	7.7	7.1						
	3	0.0		0.0	0.0		0.0	0.0	0.0						
	4	0.0		0.0	0.0		7.1	0.0	0.0						
	5	0.0		0.0	66.7		0.0	0.0	0.0						
	6	0.0		0.0	33.3		0.0	0.0	0.0						
	7	0.0		0.0	0.0		0.0	0.0	0.0						
	8	0.0		0.0	0.0		0.0	0.0	0.0						
% of Surv.	1	35.7		21.4	0.0		85.7	85.7	92.9						
	2	64.3		78.6	0.0		7.1	7.1	7.1						
	3	0.0		0.0	0.0		0.0	0.0	0.0						
	4	0.0		0.0	0.0		7.1	0.0	0.0						
	5	0.0		0.0	14.3		0.0	0.0	0.0						
	6	0.0		0.0	7.1		0.0	0.0	0.0						
	7	0.0		0.0	0.0		0.0	0.0	0.0						
	8	0.0		0.0	0.0		0.0	0.0	0.0						

Table 4.8.1: Summarised response data for centre directors' questionnaire - Questions 1 to 9.

An estimate of the mean age of the children in care across all reported age groups was determined at 36.27 months. In a normal week, all centres reported an average of 27.14 children (s = 12.98) in nappies under care. Approximately 85% (11/13) of centre directors reported that the numbers of nappy wearing children under care in a normal week were excessive for current staffing arrangements.

From centre directors, 85.7% (12/14) of centres report separating children by toileting capability. Only one participating centre separated toys between toilet trained and non-toilet trained children. All LDC centres (100%) reported using separate nappy changing areas in their facilities. Table 4.9.2 on page 103 illustrates a tabulated summary of response data for child care arrangements at participating centres.

4.10 IMMUNISATION POLICY

Amongst centre directors responses, only one of the child care centres (7.1%; 1/14) stated they had an immunisation policy in place for child care workers. Utilising Cochran's corrected chi-square, no association was established with placement of an immunisation policy and how a centre was managed ($0.50 < P < 0.25$; *phi* $\phi_2 = +0.37$), the importance attributed to the risks of both hepatitis A ($0.10 < P < 0.05$; *phi* $\phi_2 = +0.43$) and hepatitis B ($0.50 < P < 0.25$; *phi* $\phi_2 = +0.67$) by directors (Zar 1984). Table 4.10.1 on page 104 illustrates tests of association between centre characteristics and immunisation policy.

The keeping of staff immunisation records ($0.75 < P < 0.50$; *phi* $\phi_2 = -0.17$) as well as children's immunisation records ($0.10 < P < 0.05$; *phi* $\phi_2 = -1.0$) was also not associated with having a immunisation policy in place. While four

CHILD CARE ARRANGEMENTS

Survey Questions		10 (i)	10 (ii)				10 (iii)		10 (iv)	11 (i)	11 (ii)	12		13	14	15					
Question Type		Children separated	# in Age Categories at peak (months)				Separated into groups	Comments	2/3yrs same group	Children in Nappies	Acceptable	Toilet Trained Separated		Toys Shared	Area for Nappy Change	Established Procedures / Routines					
	Codes	1-2	1.5 - 15	15 - 30	30 - 42	42 - 60	1-5		1-2	#	1 - 3	1 - 6	Comments	1 - 2	1 - 2	a 1 - 2	b 1 - 2	c 1 - 2	d 1 - 2	e 1 - 2	f 1 - 2
Centres	1	1	8	10	16	24	4	xcept O/side activiti	2	38	2	6	2.5/3.5yrs mix with spe	1	1	1	1	1	1	1	1
	2	1	8		12	24	2		2	20	2	2		1	1	1	1	1	1	1	1
	3	1	8	10	16	24	2		2	25	2	2		2	1	1	1	1	1	1	1
	4	1	8	15	28	24	2		2	20	2	2		1	1	1	1	1	1	1	1
	5	1	8	10	16	24	2		2	30	2	6	15mths-2.5yrs all days	1	1	1	1	1	1	1	1
	6	1	8	10	31	24	2		1	37	3	2		1	1	1	1	1	1	1	1
	7	2								4	2	5		1	1	1	1	2	1	1	1
	8	1	8		12	24	2		2	10	2	2		1	1	1	1	1	1	1	1
	9	1	7	12	11	21	2		2	16	2	2		1	1	1	1	1	1	1	1
	10	1	8	12		22	2		2	26	2	6	into sep age groupings	1	1	1	1	1	1	1	1
	11	1	8	10	31	24	2		2	57	2	6	some, mixed groups	1	1	1	1	1	1	1	1
	12	1	8	10	14	42	2		2	26	3	4	0-2;2-3 join at 10-11 &	1	1	1	1	1	1	1	1
	13	1	14			24	2		2	31		5		1	1	1	1	1	1	1	1
	14	1								40	2	2		1	1	1	1	1	1	1	1
Average			8.42	11.00	18.70	25.08				27.14		N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Response	1	13					0		1		0	0		13	14	14	14	13	14	14	14
Counts	2	1					11		11		11	7		1	0	0	0	1	0	0	0
	3	0					0		0		2	0		0	0	0	0	0	0	0	0
	4	0					1		0		0	1		0	0	0	0	0	0	0	0
	5	0					0		0		0	2		0	0	0	0	0	0	0	0
	6	0					0		0		0	4		0	0	0	0	0	0	0	0
	7	0					0		0		0	0		0	0	0	0	0	0	0	0
	8	0					0		0		0	0		0	0	0	0	0	0	0	0
Std Dev			1.71	1.63	7.63	5.19	N/A		N/A	12.98	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Responses		14					12		12		13	14		14	14	14	14	14	14	14	14
% of Resp	1	92.9					0.0		8.3		0.0	0.0		92.9	100.0	100.0	100.0	92.9	100.0	100.0	100.0
	2	7.1					91.7		91.7		84.6	50.0		7.1	0.0	0.0	0.0	7.1	0.0	0.0	0.0
	3	0.0					0.0		0.0		15.4	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	0.0					8.3		0.0		0.0	7.1		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	5	0.0					0.0		0.0		0.0	14.3		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	6	0.0					0.0		0.0		0.0	28.6		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	7	0.0					0.0		0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	8	0.0					0.0		0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% of Surv.	1	92.9					0.0		7.1		0.0	0.0		92.9	100.0	100.0	100.0	92.9	100.0	100.0	100.0
	2	7.1					78.6		78.6		78.6	50.0		7.1	0.0	0.0	0.0	7.1	0.0	0.0	0.0
	3	0.0					0.0		0.0		14.3	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	0.0					7.1		0.0		0.0	7.1		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	5	0.0					0.0		0.0		0.0	14.3		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	6	0.0					0.0		0.0		0.0	28.6		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	7	0.0					0.0		0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	8	0.0					0.0		0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 4.9.2: Summarised response data for centre directors' questionnaires - Questions 10 to 15.

centres (28%; 4/14) retained the immunisation status of their staff and updated that information on a regular basis, ten out of 14 (71.4%) centres did not retain records.

Table 4.10.1: Cochran's $\chi^2_{corrected}$ test of association of participating centre characteristics with immunisation policy

Cochran's $\chi^2_{corrected}$ test of association of participating centre characteristics with immunisation policy					
	$\chi^2_{corrected}$ value	*df*	P - value	Cramer's *Phi* ϕ_2	*n*
How centre managed	1.17	1	*0.50<P<*0.25	+0.37	14
Importance attributed to hepatitis A by director	3.25	1	*0.10<P<*0.05	+0.43	14
Importance attributed to hepatitis B by director	1.13	1	*0.50<P<*0.25	+0.67	14
Keep staff records	0.32	1	*0.75<P<*0.50	–0.17	14
Keep children's records	2.98	1	*0.10<P<*0.05	–1.00	14

4.11 STAFF IMMUNISATION RECORDS

There was no association between sponsored LDC centres and the keeping of staff records ($0.50 < P < 0.25$; *phi* $\phi_2 = -0.33$). The maintenance of staff immunisation records was not associated with the centre director's belief of the risk of contracting either hepatitis A ($0.50 < P < 0.25$; *phi* $\phi_2 = -0.4$) or hepatitis B ($0.50 < P < 0.25$; *phi* $\phi_2 = -0.25$) in a child care setting. Table 4.11.1 on page 105 presents summarised response data on policy and staff record retention.

No association of strength was determined between the weekly opening schedule of LDC centres and the maintenance of staff immunisation records ($0.50 < P < 0.25$; *phi* $\phi_2 = +0.04$). Tabulated Cochran's chi-square tests of

STAFF- POLICY AND RECORD KEEPING

Survey Questions		16			17	18	19	20 (i)	20 (ii)	20 (iii)	
Question Type		Contact Staff			Immun. Policy	Hep A - Prev. Importance	Hep B - Prev. Importance	Staff Records	Records Update	Records Show Immunisation	
	Codes	F/T	P/T	Casual	1 - 2	1 - 4	1 - 4	1 - 2	Comment	Hep A 1 - 2	Hep B 1 - 2
Centres	1	4	7		2	4	4	1	when informed	1	1
	2	4	4	1	1	2	2	2		2	2
	3	1		13	2	3	3	2	purchase at disc. rate	2	2
	4	12			2	4	4	2	highly encourage staff to inform		
	5	12		3	2	3	3	1	2yrs	2	2
	6	8	4	1	2	2	2	2			
	7	(as many as recruit & complete assess			2	3	3	2			
	8	2		5	2	3	4	2		2	2
	9	4	4	1	2	2	3	2			
	10			9	2	3	3	2			
	11	4	16		2	3	3	1	Annually or new staff as req.	1	1
	12			12	2	3	3	2			
	13	2	5	1	2	3	3	1	as advised by staff	1	1
	14	5		8	2	2	3	2			
Average		5.27	6.67	5.40	N/A	N/A	N/A	N/A		N/A	N/A
Response	1				1	0	0	4		3	3
Counts	2				13	4	2	10		4	4
	3				0	8	9	0		0	0
	4				0	2	3	0		0	0
	5				0	0	0	0		0	0
	6				0	0	0	0		0	0
	7				0	0	0	0		0	0
	8				0	0	0	0		0	0
Std Dev		3.62	4.31	4.52	N/A	N/A	N/A	N/A		N/A	N/A
Total Responses					14	14	14	14		7	7
% of Resp	1				7.1	0.0	0.0	28.6		42.9	42.9
	2				92.9	28.6	14.3	71.4		57.1	57.1
	3				0.0	57.1	64.3	0.0		0.0	0.0
	4				0.0	14.3	21.4	0.0		0.0	0.0
	5				0.0	0.0	0.0	0.0		0.0	0.0
	6				0.0	0.0	0.0	0.0		0.0	0.0
	7				0.0	0.0	0.0	0.0		0.0	0.0
	8				0.0	0.0	0.0	0.0		0.0	0.0
% of Surv.	1				7.1	0.0	0.0	28.6		21.4	21.4
	2				92.9	28.6	14.3	71.4		28.6	28.6
	3				0.0	57.1	64.3	0.0		0.0	0.0
	4				0.0	14.3	21.4	0.0		0.0	0.0
	5				0.0	0.0	0.0	0.0		0.0	0.0
	6				0.0	0.0	0.0	0.0		0.0	0.0
	7				0.0	0.0	0.0	0.0		0.0	0.0
	8				0.0	0.0	0.0	0.0		0.0	0.0

Table 4.11.1: Summarised response data for centre directors' questionnaires - Questions 16 to 20.

association between centre characteristics and retention of staff immunisation records is presented at Table 4.11.2.

Table 4.11.2:Cochran's $\chi^2_{corrected}$ test of association of participating centre characteristics with maintenance of staff records.

Cochran's $\chi^2_{corrected}$ test of association of participating centre characteristics with maintenance of staff records					
	$\chi^2_{corrected}$ value	*df*	P - value	Cramer's *Phi* ϕ_2	*n*
Sponsored long day care centre	0.51	1	*0.50<P<0.25*	–0.33	14
Weekly opening schedule	1.31	1	*0.50<P<0.25*	+0.04	14
Importance attributed to hepatitis A by director	1.17	1	*0.50<P<0.25*	–0.04	14
Importance attributed to hepatitis B by director	0.71	1	*0.50<P<0.25*	–0.25	14

Retention of records on the status of both the hepatitis A and B immunisations of workers was reported by three centres (21.4%). Applying chi-square test with Cochran's correction for continuity determined that keeping of staff hepatitis A records was not associated with keeping of staff hepatitis B records ($0.10 < P < 0.05$; *phi* $\phi_2 = +1.0$). Tabulated test of association between retention of hepatitis A records and hepatitis B records is shown at Table 4.11.3.

Table 4.11.3: Cochran's $\chi^2_{corrected}$ test of association of participating centres with retention of staff hepatitis A records.

Cochran's $\chi^2_{corrected}$ test of association of participating centres with retention of staff hepatitis A records					
	$\chi^2_{corrected}$ value	*df*	P -value	Cramer's *Phi* ϕ_2	*n*
Retention of staff hepatitis B records	3.54	1	0.10<*P*<0.05	+1.00	7

Tests for statistical association between the reported levels of attributed importance placed by directors on staff hepatitis A and B immunisation found no association ($0.25 < P < 0.10$; *phi* $\phi_2 = +0.64$). Tabulated test of association between centre directors' belief of hepatitis A immunisation importance and hepatitis B immunisation importance is shown at Table 4.11.4.

Table 4.11.4: Cochran's $\chi^2_{corrected}$ test of association of participating centre directors belief in importance of hepatitis A immunisation and hepatitis B immunisation.

Cochran's $\chi^2_{corrected}$ test of association of participating centre directors belief in importance of hepatitis A immunisation and hepatitis B immunisation					
	$\chi^2_{corrected}$ value	*df*	P - value	Cramer's *Phi* ϕ_2	*n*
Directors attributed importance of hepatitis B immunisation	2.46	1	*0.25<P<*0.10	+0.64	14

Table 4.11.5 illustrates a comparison of directors' responses to importance of staff immunisation. As evidenced from the table, more directors attached importance to hepatitis B immunisation as opposed to hepatitis A immunisation of their staff.

Table 4.11. 5: Child care directors - tabulated comparison showing the respondent counts and percentages of importance they attached to the immunisation of child care staff.

Importance attached to staff immunisation (n = 14)	Hepatitis A		Hepatitis B	
	Responses	%age	Responses	%age
Not at all important	0	0.0	0	0.0
Some what important	4	28.6	2	14.3
Important	8	57.1	9	64.3
Very important	2	14.3	3	21.4

4.12 CHILDREN'S IMMUNISATION RECORDS

In relation to the retention of immunisation records for children in care, 93% of centres (13/14) maintained records. Regular updating of children's records was undertaken by nine centres. For both hepatitis A and B records of the children, 30% (3/10) centres reported that they kept records of hepatitis A status and 80% (8/10) kept records of the children's hepatitis B status.

Tests for association did not determine association between sponsored long day care (LDC) centres and the keeping of children's immunisation records ($0.50 < P < 0.05$; *phi* $\phi 2 = -0.53$). The summarised response data for children's immunisation records keeping is tabulated at Table 4.12.1 on page 109.

The upkeep of children's records was not associated with the director's belief in the importance of either hepatitis A immunisation ($0.75 < P < 0.50$; *phi* $\phi 2 = +0.17$) or hepatitis B immunisation ($0.90 < P < 0.75$; *phi* $\phi 2 = +0.11$) for workers. The keeping of children's immunisation records was associated with the days LDC centres were open ($0.05 < P < 0.025$; *phi* $\phi 2 = +1.00$). Cramer's correlation coefficient for dichotomous nominal scale data (Zar 1984), correlation index *phi* $\phi 2$, was positive in a range of −1 to +1 at *phi* $\phi 2 = +1.0$.

The child's country of birth was recorded by 78.6% (11/14) centres, with 57.1% (8/14) centres recording the country of birth of both the child's mother and father respectively. Tests for association did not determine association between maintenance of immunisation records of children and the recording of either father's and mother's country of birth ($0.50 < P < 0.25$; *phi* $\phi 2 = -0.24$) or child's country of birth ($0.75 < P < 0.50$; *phi* $\phi 2 = -0.14$). Tabulated Cochran's corrected chi-square tests of association between centre characteristics and children's records keeping is summarised at Table 4.12.2 on page 110.

CHILDREN : RECORD KEEPING

Survey Questions		21 (1)	21 (2)	21 (3)		22			23
Question Type		Children records	Records Update Comment	Records Show Immunisation		Details recorded			Final Comments
				Hep A	Hep B	Mother	Father	Children	
	Codes	1 - 2		1 - 2	1 - 2	1 - 2	1 - 2	1 - 2	
Centres	1	1				1	1	1	Immun should be compulsory for staff and chn; gov should make free.
	2	1	6monthly	2	2	2	2	1	nil
	3	1	Annually + parents update	2	1	2	2	2	Ask parents about lang., religious & diet needs
	4	1				1	1	1	Prin 26/27- Gov Funding Req.;Unregulateds a hazard;Gov reluctant to regulate.
	5	1	3monthly	2	1	1	1	1	nil
	6	1	3monthly or as advised	1	1	2	2	1	nil
	7	2				1	1	1	Q'aire centre oriented difficult to answer due to diff between Centres
	8	1	annually	2	1	1	1	1	nil
	9	1	as advised by parents	2	1	1	1	2	nil
	10	1		1	1	1	1	1	nil
	11	1	on-going	1	1	2	2	1	nil
	12	1	parents/2 per year	2	2	2	2	1	Will look more closely at imm staff & A &B on children's file
	13	1				1	1	1	Workers should be given free immun by gov or paid compulsory by employer
	14	1	6monthly	2	1	2	2	2	nil
Average		N/A		N/A	N/A	N/A	N/A	N/A	
Response	1	13		3	8	8	8	11	
Counts	2	1		7	2	6	6	3	
	3	0		0	0	0	0	0	
	4	0		0	0	0	0	0	
	5	0		0	0	0	0	0	
	6	0		0	0	0	0	0	
	7	0		0	0	0	0	0	
	8	0		0	0	0	0	0	
Std Dev		N/A		N/A	N/A	N/A	N/A	N/A	
Total Responses		14		10	10	14	14	14	
% of Resp	1	92.9		30.0	80.0	57.1	57.1	78.6	
	2	7.1		70.0	20.0	42.9	42.9	21.4	
	3	0.0		0.0	0.0	0.0	0.0	0.0	
	4	0.0		0.0	0.0	0.0	0.0	0.0	
	5	0.0		0.0	0.0	0.0	0.0	0.0	
	6	0.0		0.0	0.0	0.0	0.0	0.0	
	7	0.0		0.0	0.0	0.0	0.0	0.0	
	8	0.0		0.0	0.0	0.0	0.0	0.0	
% of Surv.	1	92.9		21.4	57.1	57.1	57.1	78.6	
	2	7.1		50.0	14.3	42.9	42.9	21.4	
	3	0.0		0.0	0.0	0.0	0.0	0.0	
	4	0.0		0.0	0.0	0.0	0.0	0.0	
	5	0.0		0.0	0.0	0.0	0.0	0.0	
	6	0.0		0.0	0.0	0.0	0.0	0.0	
	7	0.0		0.0	0.0	0.0	0.0	0.0	
	8	0.0		0.0	0.0	0.0	0.0	0.0	

Table 4.12.1: **Summarised response data for centre directors' questionnaires - Questions 21 to 23.**

Table 4.12.2: Cochran's $\chi^2_{corrected}$ test of association of participating centre characteristics with the maintenance of children's immunisation records.

Cochran's $\chi^2_{corrected}$ test of association of participating centre characteristics with the maintenance of children's immunisation records					
	$\chi^2_{corrected}$ value	*df*	P -value	Cramer's *phi* ϕ_2	*n*
Sponsored long day care centre	0.52	1	*0.50<P<*0.25	–0.53	14
Weekly opening schedule	4.05	1	*0.05<P<*0.25	+1.00	14
Directors belief of importance of hepatitis A immunisation	0.32	1	*0.75<P<*0.50	+.017	14
Directors belief of importance of hepatitis B immunisation	0.08	1	*0.90<P<*0.75	+0.11	14
Record mother & father country of birth	0.7	1	*0.50<P<*0.25	–0.24	14
Record child's country of birth	0.25	1	*0.75<P<*0.50	–0.14	14

CHAPTER 5

DISCUSSION

The purpose of this study was to examine the self-reported hepatitis A immunisation pattern amongst child care workers in long day care centres in the Bundaberg region. The study aimed to assess the knowledge and practices relating to staff immunisation in these centres, including whether both centre management and workers were aware of and had in fact followed through with the NHMRC recommendation for workers who care for children, to be vaccinated against infectious diseases particularly hepatitis A.

The present chapter will discuss data obtained from both questionnaires including comments from surveyed child care workers in relation to hepatitis A issues in child care settings. The rationale for this investigation was that previous research of child care centres and hepatitis A immunisation issues in this particular region of Queensland had been minimal, therefore the current study will gather contemporary information relevant to current procedures and practices.

5.1 Aspects of the Study Design

The choice of cross-sectional survey study design meant that the data collected at one point in time was self-reported behaviour as opposed to actual behaviour. Consequently, the self-reported behaviour in the study was how child care workers perceived their behaviour to be at the time and place of the survey. For example, a child care centre director might conceivably believe that they did keep accurate staff immunisation records and report: 'yes', but in reality know that the centre's record keeping was deficient or not up to the required standard in some way. While there was no confirmation of this in the survey

data, the researcher hoped that the reported behaviour was a reflection of the actual behaviour.

On the other hand, to undertake a study about actual behaviour of workers in a child care setting would have been extremely labour and resource intensive. For example, one way to observe actual behaviour in this particular setting would have been to sight and review policies and records of staff and the children to confirm currency and accuracy of those immunisation records. Permission would have had to be sought from individual centres, workers and parents of the children to access these records. Time in the field and resources required to review in excess of 100 staff records and over 1600 children's records would have been cost prohibitive to the researcher.

During the initial pre-survey phase, the researcher considered other methods for obtaining self-reported behaviour of child care workers such as personal or telephone interviews or a combination of the two with postal survey. However, the use of a postal survey allowed for a larger sample size than would have been obtained for the same resources if the researcher had selected personal or telephone interview methods for obtaining reported behaviour. The final choice of a postal survey therefore enabled a reasonable sample size that was manageable for a single researcher, with the available resources and within the time allocated.

Overall, the design of the study using the replicated survey documents of Thomson et al. (1998) worked well for the researcher. It provided the necessary data in a timely and appropriate manner to support the study's hypotheses. A study of a larger sample of child care workers in this region may have necessitated the need for an additional researcher to assist with distribution and collection of survey documents, and analysis of survey data.

5.2 Survey Response

In the present study, the child care worker survey response rate was 62.5%, as previously discussed on page 89. The response rate of child care directors was 100% (14/14). By comparison, the larger study by Thomson, Kennedy and Thompson yielded a slightly greater child care worker response rate of 74% (607/823), but a reduced child care centre director response rate of 85% (95/113) (Thomson et al. 1998). To maximise response rates to surveys in the present study, the researcher undertook somewhat labour intensive interventions to promote the return of self-administered questionnaires. These involved repeated telephone contacts at the day 14, day 21 and day 28 mark, followed by a final personal visit to all LDC centres during the sixth week, post survey mail-out. Pirotta et al. (1999) posit the view that response rates to postal surveys are influenced by the number of follow-up contacts, saliency of the topic, administering institution or body, length of survey, target audience, time taken for the study and inducements. From their 1997 research, Pirotta et al. (1999) achieved a more rapid response as well as a 6% increase in response rate by using a coloured primer postcard sent five days prior to their survey and a reminder postcard sent at the 14 day mark.

While incentives such as small gifts (for example, pens) and postcard reminders were considered as timely and cost effective methods to enhance response rates, indications of good overall response rates had been evident to the researcher during the initial pre-survey contact phase with each centre. However, upon reflection it may have been prudent in this study to have undertaken some form of either postcard prompts or additional survey mailout during the data collection phase as a less interactive intervention for enhancing responses than those methods subsequently utilised. By comparison the study by Thomson et al. (1998) restricted response prompts to telephone calls in an endeavour to improve survey return.

Considering the time taken to conduct the study survey, this researcher was encouraged by overall response rates to both survey documents. While the response rate to worker surveys may not have been high in percentage terms in comparison with other similar postal survey studies such as Bailey (1997) at 71.8% and Thomson et al. (1998) at 85%, it was higher than the study by Swerissen and Tilgner (2000). Their study achieved a response rate of 39% for health promotion professionals, 40% for health professionals, 27% for general practitioners and 45% for hospital chief executive officers in their postal survey of health professionals across Victoria (Swerissen & Tilgner 2000). The investigator therefore considered the number of returns voluble and sufficient to provide the necessary data to support the present study's hypotheses and answer the research questions.

While overall response rates for individual questions were good, the response rates to some questions were small. Not all questions in each document were answered by respondents, resulting in some of the questions not yielding the maximum available 102 responses. This subsequently yielded smaller frequencies than originally anticipated being available for calculation of chi-square (χ^2) tests of association. Therefore, to ensure that the issue of power in any of the inferential statistics was correctly interpreted, an accepted general rule of thumb was adopted for the present study. This rule states for small samples that no expected frequency should be less than one and not more than 20% of the cells should have expected frequency of less than five (Bland 1995; Kuzma 1998; Runyon et al. 1996). All chi-square (χ^2) tests of association in the present study followed this rule of thumb. If a test of association did not conform to these criteria, the null hypothesis for that test was rejected. However, in the case of the directors document (n = 14), small frequencies were encountered with some responses at 50% of sample (n = 14), requiring chi-square (χ^2) statistical tests to

be determined utilising Cochran's continuity correction for the analysis of '2 x 2' contingency tables (Bland 1995; Jordan et al. 1998; Zar 1984).

Overall, the questionnaires were well received by both child care workers and directors alike. This inference is substantiated by written comments from respondents such as: ' Reminded me of the risk I am taking by not being vaccinated...', 'It may make people more aware of the importance of immunisation against these potential death sentences...' and ' I am extremely happy to see people creating more of an awareness in relation to such important issues...'. Such comments indicated to this researcher that respondents seemed thirsty for information not only in relation to this particular hepatitis A issue but infectious diseases and immunisation in general.

5.3 Child Care Worker Demographics

Examination of demographic data collected from worker's questionnaires revealed that the 102 child care workers who responded to the survey were predominantly female at 96.1% of the sample, mostly Australian born at 91.2% and with a mean age for female workers of 29.6 years. These findings compare favourably with the Thomson, Kennedy and Thompson study where workers were 99.5% female, 86% Australian born and with an average age of 32 years (Thomson et al. 1998). The respondents' age groups from the current study are presented in a line graph at Figure 5.3.1.

Results from the current study would indicate reasonable consistency in the makeup of this workforce when compared with other child care settings such as in Victoria. The mean age of the 4 male workers in the present study was determined to be 32.6 years. Approximately 80% of the female respondent workers were found to be aged in the range 20 to 44 years. Of the sample, 83.3%

(85/102) of respondent workers indicated that their general health and well being was good.

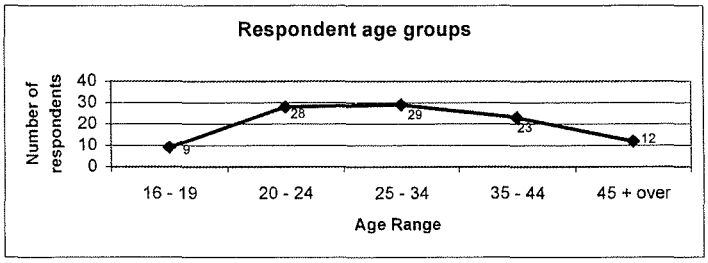


Figure 5.3.1: Line graph for question 'Please indicate your age?'

A majority of workers reported to be qualified with 66% (66/100) at Certificate III of Child Care and Education, Associate Diploma level or higher, and a further 15% (15/100) being categorised unqualified as child care assistants or in the process of completing qualifications to advance to higher Queensland recognised training standards. The remaining 19 (19%) workers reported a range of various qualifications including education, registered nursing, administration, students (at various stages of diploma or certificate training undertaking work experience) and others in support roles such as cleaners and gardeners. Two informants did not respond. On the other hand, the earlier study of Thomson et al. (1998) found lower qualification levels with more than a third having child care worker qualifications (38.7%) (Victorian standards), 52.5% were unqualified and 8.8% had other qualifications such as cooks and students.

Unlike Thomson et al. (1998), the current study did not determine an association between possessing child care qualifications and either NHMRC recommendation awareness or hepatitis A vaccine uptake (χ^2 [1, n = 81] = 0.526; $p > 0.05$; and χ^2 [1, n = 78] = 0.178; $p > 0.05$; respectively). Figure 5.3.2 displays the categories of respondent workers from the present survey. On the basis of these findings, it appears that being in possession of recognised qualifications in child

care does not infer that surveyed workers were completely aware of both the requirements for immunisation against hepatitis A or have undertaken immunisation.

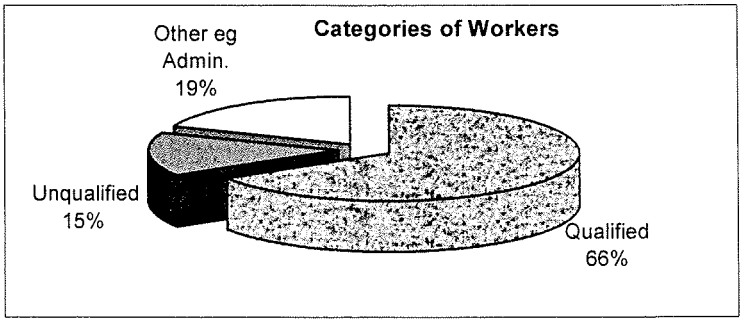


Figure 5.3.2: Pie graph for the question 'What category of child care worker do you belong?'

In terms of work practice, the results of this study are consistent with the findings of Thomson et al. (1998) in all childrens' ages most cared for and reported involvement in daily or weekly nappy changing by more than 70% of staff. The results also revealed that more than 46% of surveyed carers work with what could be described as an 'at risk' children's age group. That is, groups with non-toilet trained children specifically less than two years of age or a mixed age group, from one month to five years. The mixed age group comprised both nappy wearers and non-nappy wearers. On the other hand, Thomson et al. (1998) reported 21% usually working with children under two years of age and 38% working with mixed groups (0-5 years). All surveyed centres in the Bundaberg study, reported caring for children aged less than 15 months. The present study revealed over 28% (29/102) of respondents either very rarely or did not change nappies at all for children. However, ten staff members (9.9%) reported in the 'Other' category, either acting in a capacity as lunch time relief for all age groups of children in the centre or stated that their role was non-contact with children.

The data suggests that more surveyed workers care directly for children in the nappy wearing age groups than care for non-nappy wearers. This finding compares favourably with similar levels of workplace exposure to nappy changing by child care workers as reported by Thomson et al. (1998) at 78% and it would appear by implication to the risk of faecal contamination regardless of the location of the child care setting. Furthermore, these results imply that there are some workers with no direct contact with nappies, who may also be potentially at risk of exposure to hepatitis A through their contact with other workers who do change nappies during workplace activities such as staff rotation, shift change, group change or at meal and rest breaks.

It is worth noting that the Department of Employment, Training and Industrial Relations (DETIR) and others state conditions in child care centres favour the spread of infection because of the number of non-toilet trained children and the resulting demands for attention placed on staff (DETIR 1999; Hadler et al. 1980; Hadler & McFarland 1986). Even meticulous hygiene practices can break down when demands are high and hepatitis A can spread rapidly before its presence at a centre is detected (DETIR 1999). Non-toilet trained children (toddlers), as part of their daily activities, will touch their nappies, contaminate their hands, put them into workers mouths and contaminate toys and many other objects with which a worker will also come into contact. Scrupulous hygiene practices will minimise the spread of disease for toddlers no longer in nappies, but not so through hygiene alone where nappy wearers are involved. Preventing hepatitis A infection in child care workers may only be achieved satisfactorily through immunisation (DETIR 1999; NHMRC 1997, 2000).

5.3.1 Worker Immunisation Status at Commencement

Significantly, 67.3% (68/101) of workers reported they were not asked about their immunisation status when commencing with their current employer. The present study also revealed that approximately 82% of employers reportedly did not organise or pay for staff to be immunised for hepatitis A. Further, only a small number of workers (7.3%; 4/55) reported their employer had subsequently updated their immunisation status by organising and paying for the appropriate vaccines after commencement. Response percentages to the question of immunisation at commencement with employer are given at Figure 5.3.3.

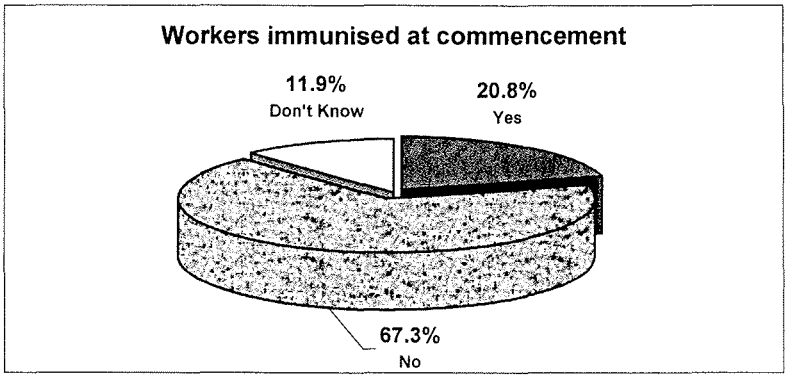


Figure 5.3.3: Pie graph for the question ' Were you asked if you were immunised when you commenced work with your current employer?'

These results suggest a lack of awareness of responsibilities by employers under workplace health and safety legislation or perhaps that both parties, employees and employers, need to consult about such issues during staff recruitment and selection. It may seem a moot point, but nevertheless responsible infection control in the workplace as espoused by Horton, Parker and Glenister and others must involve both workers and management in the process for it to be effective (Benenson 1990; Horton, Parker & Glenister 1997; Mutton & Gust 1984; Tortora et al. 1986). The DETIR also cite Queensland Health's support for the recommendations of the NHMRC regarding hepatitis A vaccination for child care workers (DETIR 1999). Therefore, to meet workplace

health and safety (WHS) requirements, child care centres have a duty of care to ensure that workers are vaccinated against hepatitis A

5.4 Hepatitis A

At the time of survey only one worker acknowledged they had actually suffered with hepatitis A illness and subsequently diagnosed with the disease. Of informants, 95.1% had not suffered with the illness while four (3.9%) did not know or were unsure. In relation to the question of hepatitis A vaccination uptake, only 34.7% (35/101) stated they had been vaccinated against hepatitis A, while 64 workers had not been immunised and two workers were unsure. These results are shown in a pie graph at Figure 5.4.1.

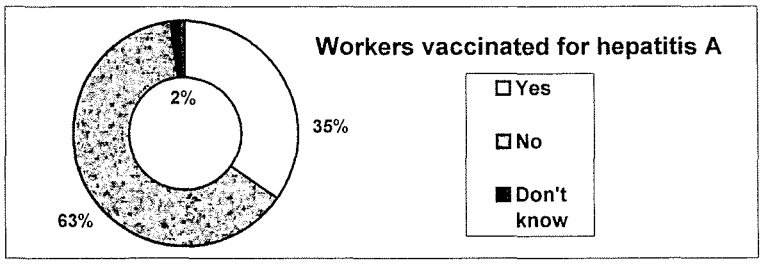


Figure 5.4.1: Pie graph for the question 'Have you been vaccinated against hepatitis A?'

While these reported levels of hepatitis A vaccination are low, it was stronger than previous findings by Thomson et al. (1998) who, by contrast, reported much lower levels of Victorian child care staff hepatitis A vaccination at 11%. Furthermore, this lower vaccination rate was despite finding 79% of workers in the Thomson et al. (1998) study changing nappies at least weekly and most believing that their occupation placed them at increased risk compared to the community. By comparison, the present study also reported more than 70% of workers changed nappies at least weekly and 79.5% of workers also believed their occupation placed them at increased risk compared to the community.

More than three quarters of the workers (78/101) stated that, prior to receiving the questionnaire, they were aware of the risks of catching hepatitis A from infected children in their care, while 21 workers (20.8%) reported they were not aware of the risks. In the current study, chi-test calculations determined that there was association between hepatitis A immunised workers and their awareness of the risks of catching hepatitis A from children in their care (RR 1.33; $\chi^2\{1, n = 96] = 8.63$; $p < 0.05$). Though weak, this strength of association was established in a positive direction at *phi* $\phi_2 = +0.29$ (Groninger 1990; Zar 1984). On the other hand, Thomson et al. (1998) found no association between reported vaccination for hepatitis A and awareness of the risk.

Approximately 80% (81/102) of workers reported that their perception of risk for non-immunised workers of contracting hepatitis A compared with someone not working in child care was high but was not associated with their immunisation for hepatitis A ($\chi^2[1, n = 99] = 1.176$; $p > 0.05$). Moreover, while a comparison with hepatitis B was similarly high, the perception of hepatitis B risks also had no statistical association with reported hepatitis B immunisation levels of workers ($\chi^2[1, n = 101] = 0.169$; $p > 0.05$). This study also found that when responding to a similar question regarding hepatitis B, the perception of risk for non-immunised workers of catching hepatitis B when compared with someone not working in child care was also high at 80.4%.

In the current study, chi-square tests of association revealed that those workers who believed that hepatitis A infection risks were greater for them than for other industry workers were significantly associated with those workers who also believed that hepatitis B infection risks were greater for them than workers from other industries as well (RR 2.7; $\chi^2[1, n = 102] = 37.15$; $p < 0.05$). Cramer's correlation index indicated high positive direction toward agreement of association with *phi* $\phi_2 = +0.6$ (Groninger 1990; Zar 1984). These findings are in

agreement with the study by Thomson and others, supporting the belief that their occupation places them at higher risk of both hepatitis A and B than others in the community (Thomson et al. 1998).

Contrary to the study by Thomson et al. (1998), this study revealed high levels of both awareness of the availability of hepatitis A vaccine (93.1%) and of the NHMRC recommendations (73.5%). An association was determined between the level of awareness of NHMRC guidelines and reported hepatitis A immunised workers (RR 1.35; χ^2 [1, n = 99] = 6.15; $p < 0.05$). Using the correlation index *phi* (ϕ), this association was positively directed at $\phi_2 = +0.25$. This particular finding was in agreement with Thomson et al. (1998), who found in their larger study that immunised workers were also more likely to be aware of the guidelines (OR 5.7, 95% CI 3.2 - 10.4, n = 570). This area has implications for training as increased knowledge of NHMRC guidelines is an important influence of worker behaviour and should be considered for inclusion in training curriculums. For child care workers immunised for hepatitis A in the present study, 28 (80.0%) stated they chose the vaccine uptake because of occupational risks in a child care setting. Of the remainder, three chose immunisation for overseas travelling reasons, with four stating other reasons such as parental persuasion or because of previous employment. Approximately 45% (16/35) of those immunised stated they had arranged their own vaccination through their general practitioner. This compares with 25.7% (9/35)) who had their schedule arranged by their employer. That is, nearly twice as many workers arranged their own vaccination than their employer, suggesting workers were more responsible for workplace obligations under the WHS legislation than employers. Nearly 86% (30/35) of reported hepatitis A vaccinations completed were paid for by individual workers. The remaining five (7.8%) were paid for by the employer.

Of the 64 (63.4 %) responding child care workers who were not immunised for hepatitis A, the following reasons were provided: (a) cost of immunisation – (27) [42.2%]; (b) not having thought about it or forgot – (14) [21.9%]; (c) not liking injections – (9) [14.1%]; (d) unaware of risks of contracting hepatitis A in their occupational setting – (7) [10.9%]; (e) being unaware that vaccine was available – (5) [7.8%]; and (f) advised by a doctor not to be immunised – (2) [3.1%]. These results are displayed at Figure 5.4.2.

In contrast, Thomson et al. (1998) found that the two most common stated reasons for not being vaccinated were being unaware of vaccine availability (31%) and unaware of occupational risk (30%). From the current investigation, none of the respondents stated that they were not immunised because: 'they believed immunisation to be dangerous', despite the response being listed as an option within the questionnaire responses. However, three written comments were recorded from respondents stating that: *"...they did not believe in the theory or process of immunisation"*.

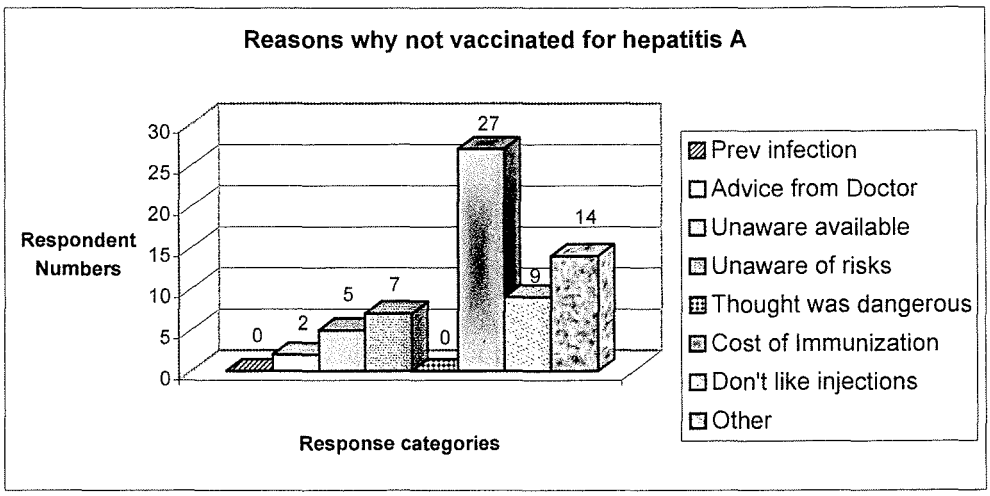


Figure 5.4.2: Column graph for the question 'If not vaccinated against hepatitis A, please circle the reason which best describes why not?'

In the Bundaberg study, the issue of vaccination costs appears to be a concern for many workers (42.2%). Hepatitis A vaccination is not cheap, and

arranging and paying for vaccination should be an important consideration during recruitment and selection. Thompson and Kennedy (1998) and Thomson et al. (1998) both suggest that child care centres may need some form of government assistance such as financial remuneration or subsidy to implement these NHMRC recommendations. Overall, 54.7% reportedly seem to have had no valid reason whatsoever. Interestingly, only 28 workers reportedly vaccinated for hepatitis A actually reported occupational risk as the reason for vaccination, compared with 50 workers vaccinated against hepatitis B. However, the foregoing data from Figure 5.4.2 implies that for the outlay of less than $100, many workers are putting their health and others including co-workers and family members, as well as incomes and livelihoods, at risk by not being vaccinated against hepatitis A.

This investigation suggests linking the cost of staff immunisations either with centre licensing requirements or as a workplace deduction for workers within the framework of the federal government's income taxation legislation. It is also worth noting that the vaccine is currently not funded by Queensland Health for the purpose of vaccinating child care workers (DETIR 1999).

The research suggests a general perception among workers that hepatitis A and hepatitis B may be one and the same, or that hepatitis is hepatitis. This presents as an education and training issue for all stakeholders including child care workers, centre directors, management bodies and employers. The study's reported low level of hepatitis A vaccination is a concern. The NHMRC recommendations for child care workers to be immunised are documented (NHMRC 1997, 2000). The occupational risks associated with working and caring for nappy wearing children is recognised and also documented in the literature review. Outbreaks associated with day care settings are also recognised. Many of these findings are in agreement with similar findings by Thomson et al. (1998)

and suggest shortcomings in adherance with NHMRC recommendations and obligations under WHS legislation (DWHS 1995; NHMRC 1997, 2000).

5.5 Hepatitis B

Most respondent workers (90.2%) were well aware of the risks of hepatitis B in their workplaces, while 9.8% indicated that they were either unaware or did not know one way or the other about the risks, prior to receiving the questionnaire. Similarly, almost all workers (98%) stated that they were aware that immunisation was available and that the procedure involved a number of injections over a period of a few months. Only two respondents reported they were unaware. Both of these results are higher than for the corresponding questions for hepatitis A, at 77.2% and 93.1% respectively and further suggest higher awareness of hepatitis B issues than for hepatitis A in the community. Figure 5.5.1 illustrates the percentage comparison between respondents' knowledge of the availability of hepatitis A and B immunisation.

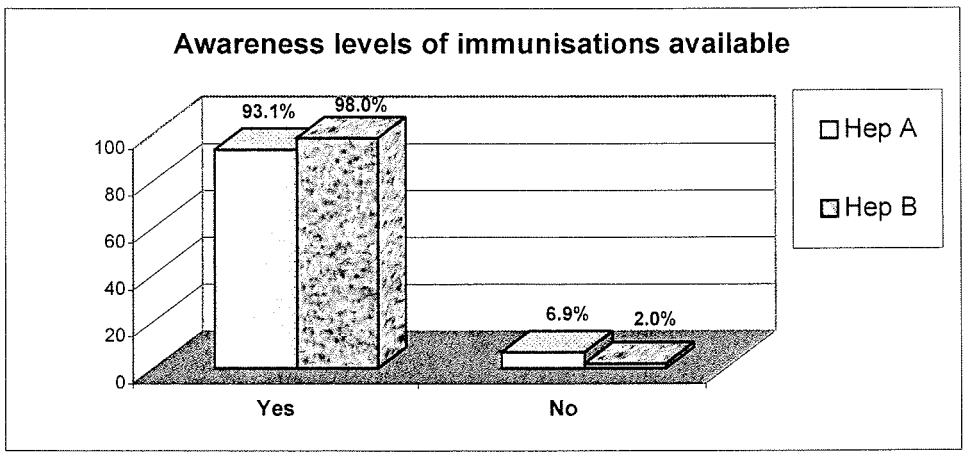


Figure 5.5.1: Column graph showing percentage comparison for questions 'Did you know that immunisation against hepatitis A and B was available?'

The study by Thomson et al. (1998) revealed a reasonably high awareness level of risks of hepatitis B at 77% and a similarly high level of awareness of the

availability of hepatitis B vaccine at 95% as the present investigation. However, in the Bundaberg study there was no relationship between the level of worker awareness of hepatitis B and a similar level of awareness of the availability of the hepatitis A immunisation (χ^2[1, n = 102] = 5.939; 2 cell counts <5.0). That is, a high level of worker awareness of hepatitis B immunisation did not translate to a similar level of hepatitis A immunisation awareness.

There was a significant difference in the reported levels of vaccination for hepatitis B at 63.7% compared to hepatitis A at 34.7%. This difference suggests a perception of hepatitis B being of higher risk and importance as an occupational issue for workers than hepatitis A. Further, more than 75% (50/65) of these immunised workers stated they chose hepatitis B vaccine primarily due to the occupational risks associated with working in child care settings. On the other hand, 36 workers reported they were not immunised for hepatitis B. These results seem to indicate that there still quite high levels of non-immunised child care workers for both hepatitis A and B within the long day child care community of the surveyed centres. The results from this particular survey question are presented in a pie graph at Figure 5.5.2.

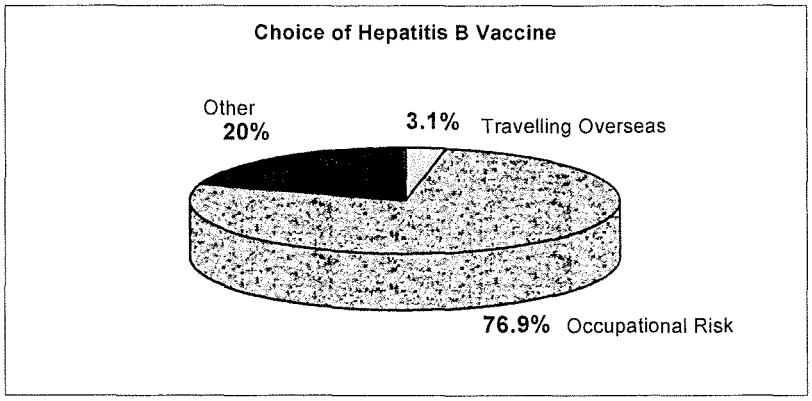


Figure 5.5.2: Pie graph for the question 'Why did you choose to receive the hepatitis B vaccine?'

On the other hand, Thomson et al. (1998) found a very similar hepatitis B vaccination levels at 64%, with a correspondingly higher occupational risk reason for vaccination at 90%. Those workers in the present study who had a high perception of the risks of hepatitis A were also found to be associated with a perception of similar risks from hepatitis B infection in the child care setting. The correlation index was determined as reasonably strong at $\phi_2 = +0.48$ (Groninger 1990; Zar 1984).

Further, while only 30 of the 65 self-reported hepatitis B vaccinated workers had subsequently undertaken a post-vaccination blood test, a little more than half (55.1%) of those had then not undertaken serological testing to confirm post-vaccination immunity (thus, full immunisation), recommended three months after the third dose of the hepatitis B vaccine (NHMRC 1997, 2000). This statistic implies that 43.5% (30) of hepatitis B vaccinated workers reportedly work with their immunity unchecked, under the assumption they have sero-converted and thus afforded protection. Blood tests ensure that immunity is conferred and that the vaccine has not failed for some other medical reason. This also suggests that even after undertaking the prophylaxis (that is, the means of prevention), managing this aspect of infection control to its final outcomes is not being fully maintained and monitored to the NHMRC standards (NHMRC 1997, 2000). Moreover, these facts could also mean that many workers either don't understand the process or have not been fully informed about the requirements. This eludes to a training need or lack of dissemination of relevant information at workplace level.

A comparison between numbers of respondents vaccinated for hepatitis B and those respondents who were also aware of the risks of contracting hepatitis B from infected persons in the child care setting is illustrated at Figure 5.5.3. This figure suggests that higher awareness levels by workers do not necessarily translate to vaccination uptake.

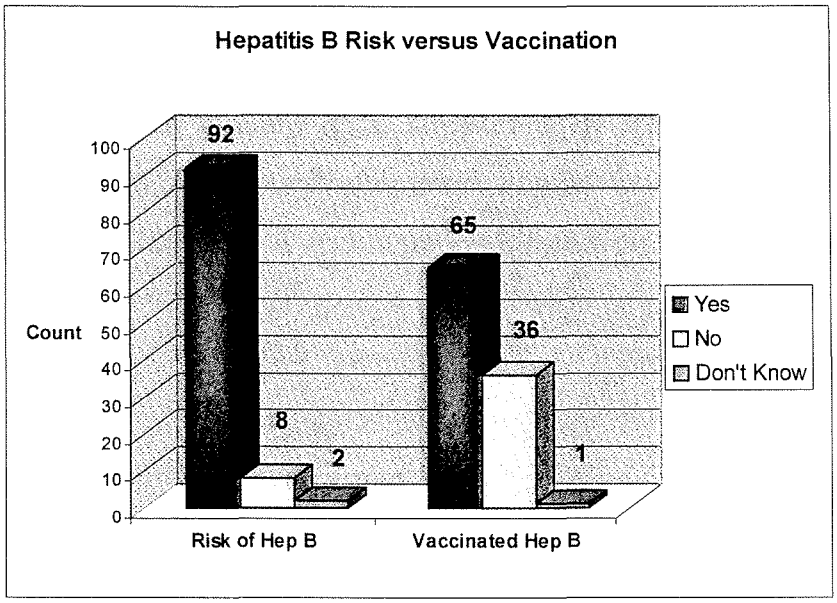


Figure 5.5.3: Column graph showing comparisons for questions 'Have you been vaccinated against hepatitis B?' and 'Did you think you were at risk from catching hepatitis B from infected persons in a child care setting?'

The study revealed that another 20% (13/65) of workers stated a variety of other reasons for the uptake of hepatitis B immunisation. These included doctor's recommendation, sporting activities, parental persuasion, as a consequence of previous illness, family circumstances, previous occupational setting and employer offer. Only 3.1% (2) of hepatitis B immunised respondents chose to uptake the vaccine because they had travelled or were contemplating travelling overseas. Significantly, those child care workers immunised for hepatitis A were also associated with immunisation for hepatitis B (RR 2.14; $\chi^2[1, n = 99] = 26.26$; $p < 0.05$). The strength of this association was established at $\phi 2 = +0.52$, suggesting that those workers immunised against hepatitis A were more likely to be immunised against hepatitis B.

Both previous research by Thomson et al. (1998) and this study are in agreement with approximately two thirds of workers from both studies reportedly vaccinated against hepatitis B. It suggests that child care workers

perceive themselves to be at increased risk of hepatitis B through their work than hepatitis A and this may be due partly because of the influence of higher reported perception of risk by directors (85.1%) or that the employers arranged their vaccinations. This current data, supported by the previous research of Thomson et al. (1998), suggests similar confusion by workers between the risks and consequences of hepatitis A and hepatitis B infection.

5.6 Training

Only five informants reported to have attended immunisation and infectious diseases courses at Queensland TAFE institutions over the preceding seven years. On the other hand, the survey of workers reported 92 (91.1%) had not attended any courses or training about staff immunisation. Further, one respondent, an ex-registered nurse previously immunised for hepatitis B when conducting daily vene-puncture work in a pathology laboratory, had undertaken more specific training related to pathology and safe hygienic practices, but had not, after two years in child care, attended any training on recent immunisation and infectious disease issues pertaining to child care settings.

A number of other training issues were specifically reported upon by some respondents through written commentary that indicated to this investigator that training was well regarded by respondents. These included (a) the desire for more information about the exact nature and quantum risk of hepatitis infection for the child care industry; (b) that education and training sessions were extremely valuable communication strategies and should be followed through more in actual practice; (c) that there was a need for greater community awareness as people can be careless; (d) information awareness sessions should include parents; (e) governments should pay for immunisation awareness programmes; and (f) awareness programmes should be linked to the

national child care assistance programme because of the millions of dollars spent by the Federal Government annually on child care assistance across Australia.

Another respondent, (a Group Leader, 0-2year age group) also made the following supporting comment: *'For the high standard of health and hygiene for all child care workers and children in their care, immunisation should be [sic] great importance. But little or no importance has yet to be focused on this issue. The Federal Government should either set-up an immunisation programme or awareness programme or pay for our medical expenses incurred in receiving our immunisations.'.*

No association was attributed between reported training attendance and either hepatitis A or hepatitis B vaccination uptake and surveyed worker immunisation. This was substantiated by the survey's findings of low levels of reported recent attendance at training and education on immunisation related issues and strategies at only nine (8.9%) respondents. Poor training about the importance of immunisation against occupationally acquired diseases is further evident in the reported low levels of actual immunisation for hepatitis A at 34.7% and hepatitis B at 63.7%. On the other hand, it could be argued that the level of qualified respondents (66%) reflects not only the low levels of immunisation but may have correspondingly affected the priority placed upon training in some centres. Research by Thomson et al. (1998) also determined similar findings in that hepatitis A was not significantly associated with attendance at outside educational activities. Some of the issues of training importance for staff in such occupational setting should include risk minimisation of communicable diseases, identfying the hazards and the importance of consistent and accurate documentation.

5.7 Centre Management and Demographics

Of those centres community based, three were sponsored, two by the Young Mens Christian Association (YMCA) and one by a local government authority. As anticipated, 93% (13/14) of participating centres were formally categorised as long day care centres. The exception being the previously mentioned family day care centre, which for all intentions was identified as a LDC centre. Twelve of the surveyed centres (85.7%) were located within the Bundaberg city area, while of the remainder, one each were located at Bargara (Burnett Shire) and Gin Gin (Kolan Shire) respectively.

A majority of the LDC centres (93%; 13/14) were found to have similar days of operation at five or more days per week, with one centre open for three or more days of the week. The number of hours per day open ranged from ten to 12 hours (mean 11.43; s = 0.80). Centres were licensed for between 38 and 75 children (mean 63.23; s = 13.21). Previous research by Thomson et al. (1998) revealed similar findings with a majority of 84.7% of centres open for five days, number of hours per day open (mean 9.1; s = 3.1) and licensed for children (mean 36.3; s = 16.6). In the present study, the data revealed that the total number of children and toddlers under full and part time care was 1,601 children. Amongst all surveyed centres, the children's ages ranged from less than one year to more than 12 years, with all but one centre accepting children for day care at less than six months of age.

5.8 Centre Operational Arrangements

All LDC centres reported they separated children into age groups for most of the day, except during early morning and late afternoon when they were mixed with all age groups or sometimes with other children with special needs. The numbers of children in each age group at each surveyed centre were found

to be fairly similar across all sampled centres. This could be attributed to Queensland government regulations which stipulate the numbers of children per age group or mixed age group and contact staff. For example, Regulation 16 of the Child Care (Child Care Centres) Regulation 1991 of Queensland, for the Department of Families, Youth and Community Care (DFYCC), states that the maximum number of children in the age group '0 to 2 years' is eight children. If the number of children in an age group is greater than half the maximum number, then group leader must have an assistant (DFYCC 1991).

Directors at some centres reported that separating age groups with nappy wearers could not always be achieved because of staff limitations in order to accommodate the extended working hours of long day care centres. For example, not all the two and three year olds were reported as always being in the same group, with mixed groups of nappy wearers and toilet trained children at 91.7% (11/14) of centres. Follow-up discussions with various centres revealed that children may be moved up or transferred to the next age bracket at the discretion of staff members. In most instances, this decision was found to be based upon assessment of the child's toileting capabilities by centre staff as opposed to relying on the child's actual age, such as two years. Most centres (85.7%) chose to separate children by toileting capability at the children's daily outdoor time, for example - 10.00am to 11.00am. However, one of the LDC's preferred to separate by age group all day as opposed to toilet training capability, with a second centre opting not to separate at all. A total of 13 centres reportedly allowed sharing of toys between toilet trained and non-toilet trained children. Following further discussions and follow-up, it was gleaned that a number of centres practiced daily toy sanitisation by use of disinfectants in lieu of actually separating the toys.

From surveyed centres, a total of 380 or on average 27.14 children (s = 12.98) per centre wore nappies on a weekly basis. This figure exceeds the number

reported for full time children under care 164 (mean 11.71 children; s = 7.89) and the numbers of children in the less than 15 months age bracket (mean 8.42 children; s = 1.71). This finding appears to indicate that a larger proportion of part-time children tend to be nappy wearers or in a nappy wearing age group. This further supports the finding of potentially higher levels of exposure for workers because the study revealed higher numbers of part time or casual children at 1437 (mean 102) compared to full time children at 164 (mean 11.71) across all centres. The study found that all centres utilised separate nappy changing areas in their facilities.

It can not be emphasised enough, that the type of care administered in LDC's is extensive and includes such tasks as feeding, playing with children, nursing and putting to sleep, assisting with developmental education, changing nappies and clothes, washing and cleaning of faecally contaminated children, nappies, clothing, bedding, items of furniture and in some circumstances toys and play items. May (1998) advises that it is also not enough simply to tell children to wash and dry their hands, they need supervision. It should not be assumed that older children would do it automatically, they need constant encouragement as well. All LDC's reported having established procedures for many routines including hand washing before snacks and meals, food and drink preparation, nappy changing, toileting and safe disposal of faeces. No association was determined between maintaining separate nappy changing areas and keeping of children's immunisation records. On the other hand, the Thomson et al. (1998) study revealed that 90% of centres had separate areas for changing nappies. However, they also did not find significant association between having a nappy changing area and children's immunisation status.

5.9 Centre Staffing Arrangements

All centres utilised a variety of staffing combinations to fulfill their child care services, that is full time, part time or casually employed workers or a mixture of all three categories. However, the majority of centres (10/14) utilised more part-time and casual staff (average 5.8) than full-time staff (average 5.27). These were formally identified as 'contact' staff because they may come in direct contact with faecal matter during handling and cleaning of soiled linen, nappies, toys and other items when changing nappies of children and toddlers. The survey reported total staff numbers of 152 workers from 14 centres. Only 38% (58) of workers were employed on full time duties. It would appear from the study, that long day care centres surveyed in the Bundaberg area do have a stronger preference for employing workers on a part time and casual staffing basis, with 94 workers in this category. Of particular interest was the finding that two (14.2%) centres employed only casual staff, whilst another centre comprised only full time workers. However, actual survey respondents in the study were predominantly full time workers (66%), with less part time (15%) and casual (19%) respondents.

This finding raises the question of whether long day care centres tend to focus on part time and casual staffing arrangements as an intergral part of their core business for some other perceived benefit. Such arrangements may seen by many to provide short time benefits for staffing these types of centres given that they operate outside traditional working hours. That is between the hours of 6.00 – 8.00 am and 5.00 – 7.00 pm. Some of these benefits may include more flexible working arrangements for child care workers, experiential opportunities for student workers, staffing to accommodate the longer hours of operations for LDC centres and filling a community need. However, a major drawback resulting from increased use of part time and casual staff is the higher turnover of workers through child care workplaces. This is also revealed in the study,

with all respondents having worked for a mean of only 5.08 years in child care services. Further, only nine workers reported they had worked for 12 years or longer in child care, with two of these over 20 years of employment. This suggests short retention times by child care centres.

Higher utilisation levels of human resources presents increased numbers of workers exposed to potential risks of communicable diseases such as hepatitis A in this particular setting. This in turn may have an impact on the broader community population within a particular region through potential spread of infections. An additional dimension is that the preference for part time and casual staff could be interpreted by some as being detrimental to retaining the knowledge base of the industry in a particular region, location or facility. Furthermore, in the longer term, high staff turnover may affect the impact that training contributions by employers or authorities make towards establishing and maintaining consistent knowledge levels and experience base required for future full time child care workers. The issue of high staff turnover may be another important area for further research.

5.10 Issues Relating to Policy and Procedures

From the study, 92.8% of centres (13/14) reportedly did not have immunisation policies and procedures in place. This finding suggests some concern for the high level of non-compliance with relevant legislation. The statutory requirements in this area are quite extensive, covering a number of pieces of legislation in the State of Queensland. Immunisation is a form of risk control for controlling communicable and vaccine preventable disease. A policy is an important facet of managing the workplace and communicates to others how matters and workplace issues are to be handled by the organisation. Other risk control strategies in the child care setting may include hand washing, systematic cleaning and disinfection, and the exclusion of infected staff and

children (Sebastian 1987). The child care centre's immunisation policy should reflect the assessed level of risk that pertains to each setting and associated tasks or undertaking for children, workers and visitors alike. Both DETIR (1999) and Lee and Bishop (1997) state that vaccination programs are not just for the benefit of children, as many diseases affect both adults and children alike. Some of the relevant child care industry legislation pertaining to documentation will now be discussed.

5.10.1 Child Care Act

The Child Care Act (Queensland) 1991, Section 23 (1) states: *'A licensee of a child care service must provide the child care service in a way that is safe and suitable for the provision of child care of the type authorised under the license.'* (DFYCC 1991). Section 23 (2) continues with a list of measures that a licensee must take and includes: *'.....(b) providing adequate health and hygiene facilities and ensuring their appropriate use in relation to any place where child care is provided; and (c) establishing and maintaining appropriate procedures and practices concerning health and hygiene;.....'* (DFYCC 1991).

Section 26(1) of the Child Care Act states that: *'A licensee of a child care centre must keep or cause to be kept in relation to the child care service records as required by the regulations.'* (DFYCC 1991). Section 26(2) continues by listing particular records that may be prescribed for the purposes of Section 26 (1) of the Act and some of these include: *'(a) relevant personal and health particulars of children; and..... (f) relevant particulars of persons engaged by the child care service including qualifications and personal health particulars; and.....(k) any other matter relevant to the safe and effective provision of child care.'* (DFYCC 1991.

5.10.2 Child Care Regulations

In the Child Care (Child Care Centres) Regulation 1991, Queensland, Regulation 9 details written information about the day care scheme that is to be provided to parents and includes the scheme's policies and practice in relation to hygiene, safety, emergency and evacuation procedures and injuries, illness and infectious diseases (DFYCC 1991). Regulation 11 (1) states that a licensee must keep up to date records in relation to each child including the child's health details such as illnesses, injuries, allergies and immunisations notified by a parent (DFYCC 1991).

Regulation 34 further describes the functions of directors including identfying and assisting in meeting in-service training needs of staff and maintenance of the child care centre's records (DFYCC 1991). Regulation 37 also reinforces these statutory requirements further by stipulating that: *'The licensee must ensure that care providers observe strict health and hygiene practices that have regard to current community standards, and current information provided by relevant government departments, to minimise health risks.'* (DFYCC 1991).

5.10.3 Other Responsibilities and Obligations

The Workplace Health and Safety legislation (including Act, Regulations and Advisory Standards) in Queensland sets a standard of conduct for all workplaces statewide by clearly describing the health and safety rights and responsibilities of everyone at the workplace. Amongst a number of obligations, it establishes that employers have a legal obligation to ensure the health and safety of all employees as well as ensuring that anyone entering premises is unaffected by the work or work environment (DWHS 1995). In a child care setting this includes parents, visitors and obviously the children in care, no matter how long the duration of the visit. This is known as an 'obligation' or

more broadly a 'duty of care' and involves doing whatever is practicable. What is practicable is determined by weighing up the level of risk against the cost of controlling it. Further, the WHS legislation in Queensland requires employers to generally manage the workplace by identfying hazards, undertaking risk assessments, implementing controls and monitoring measures, as well as providing adequate information, instruction and training appropriate to the job and task, thereby ensuring the health and safety of his or her workers (DWHS 1995). Employers can delegate certain responsibilities to individual workers, however the employer's duty of care can not be delegated (Caton & Roche 1999). Documents such as policy, procedures and risk assessments detailing how a child care centre intends to control the risks associated with hazards like infectious diseases are recognised ways of fulfilling those requirements.

Under common law, every employer has a duty of care to employees and others. Common law is based upon decisions laid down by previous cases, which have built up a substantial body of law (CCH 2001). This means employers should provide 'reasonably competent staff', sufficient number of workers to carry out the work safely, a place to work that is safe and without risks to health, proper plant and equipment and safe systems or methods of work (CCH 2001). Howard (1996) also reminds us of the employer's statutory duties to minimise risks in the workplace by identifying, controlling and eliminating risks through appropriate preventative measures. These obligations and 'duty of care' provisions suggest the fact that conditions at a site are not in accordance with statutory requirements and relevant standards can be enough to establish the liability of an employer (CCH 2001).

The NHMRC (1997) advised that child care workers should receive routine booster doses of a number of vaccines such as diptheria and tetanus and further, should be immunised against a number of other communicable diseases including hepatitis A. The recently released *Australian Immunisation Handbook* 7th

Edition has strengthened the NHMRC's recognition of the risk of occupationally acquired hepatitis A and now strongly recommends vaccination for child day-care personnel (NHMRC 2000).

The purpose of the *Quality Improvement and Accreditation System Handbook* administered by the National Childcare Accreditation Council (NCAC) for child care is to ensure that children in day care centres have high quality care (NCAC 1993). This process is underpinned by 52 Principles that define particular aspects of quality within key areas of child care activities. In relation to the present study, Principles 44 and 47 of that Quality System set out quite specifically the standard requirements of centres for written policies on hygiene, medical, emergency and accident procedures and further, on the accessibility of information on health and other related issues to staff (NCAC 1993).

Adherence to these Principles is prerequisite toward accreditation of centres and thus registration with the NCAC in order to receive Commonwealth Government Child Care Assistance (NCAC 1993). These principles are reinforced by Caton and Roche (1999) who advise that the courts recognise that children do not have the capacity to appreciate danger and take evasive action, and together with their size and naivety, this makes them more susceptible to injury and illness. Therefore, it behoves employers and employees to be even more mindful of the need for immunisation policies as part of a day care centre's overall approach to risk management of infectious diseases in such workplace settings.

Following recent audits of child care facilities in South East Queensland, the DWHS, a division of DETIR, have now further strengthened their recommendations for immunisations of child care workers (DETIR 1999). Their key findings for controlling risks associated with infectious disease also included immunisation, education of workers and parents, stringent hygiene practices,

recording of workers' immunisation and infectious disease history and exclusion of 'at risk' workers during outbreaks.

Findings from the present study suggest that LDC centres in the Bundaberg region have either not yet fully implemented appropriate immunisation policy protocols for workers or may not be clearly aware of both the NHMRC recommendations and the full extent of their obligations as employers under current WHS and child care legislation.

5.11 Perception of Risk

The current investigation found more centres (12:10) placed importance on hepatitis B (85.7%) immunisation of staff than hepatitis A (71.4%) as tabulated in Table 4. 11. 5. Thomson et al. (1998) also found centre directors reported that they considered both hepatitis A and hepatitis B a significant issue in the workplace, but with more centre directors attributing higher levels of importance to hepatitis B immunisation (75.5%) than hepatitis A (38.8%). The risk perception of catching hepatitis B from infected persons in the child care setting was similarly reflected in the present study as higher for hepatitis B at 90.2% than the risk perception of catching hepatitis A from infected persons in child care setting at 77.2% for hepatitis A. However, when respondents were asked to rate their occupational risk perception in comparison to someone not working in child care settings, the levels were also similar (hepatitis A - 79.5%; hepatitis B - 80.4%) confirming a higher risk perception rating for those working within child care occupations than with others (non child care) in the community.

In the present study, the perception by child care workers that their occupation may place them at an increased risk of hepatitis B than hepatitis A (if only slightly higher) is also similarly reflected in the higher rate of hepatitis B

immunisations and in the higher importance attributed to hepatitis B immunisations by centre directors. The study by Thomson and others in 1996 revealed identical findings, albeit across a much larger statewide sample (Thomson et al. 1998).

Whilst immunisation against hepatitis B is not recommended for child care workers by NHMRC because of occupational risk, nearly twice as many long day care centre workers in the Bundaberg study reported immunisation against hepatitis B (65/102) as opposed to hepatitis A (35/101). When the NHMRC (1997) recommended that all infants and pre-adolescents be vaccinated against hepatitis B, it preferred to state that staff at child care centres were at minimal risk of hepatitis occupationally and: 'vaccination might be justified', on advice from local health authorities. However, previous studies agreed with the NHMRC in that hepatitis B vaccination was not routinely recommended suggesting that transmission of the hepatitis B virus in a child care setting was a rare occurrence (Thomson et al. 1998).

In the intervening time since the current survey was conducted, the *Australian Immunisation Handbook 7th Edition* has been released and the NHMRC has not altered its view or recommendations on hepatitis B occupational risks for child care workers (NHMRC 2000). The study's findings appear contrary in these areas, with higher level of worker perception of the risk of hepatitis B and more reported hepatitis B immunisations than for levels of risk perception of hepatitis A and lower reported hepatitis A immunisations. These findings suggest a general misconception by surveyed workers and perhaps others about the exact level of risk of these diseases in child care workplaces. This is further reinforced with finding that 58.4% of hepatitis B vaccinated respondents failed to undertake the post-vaccination blood test to confirm immunity.

Overall, the higher level of perception of risk revealed amongst workers in the present study is not consistent with the reported low level adoption and implementation of policies. Child care settings have considerable potential for increased risk of infections (Ferson 1993, 1997) and therefore may be regarded as an occupational, health and safety issue for child care workers (DETIR 1999; Hanna & Brookes 1994). Workers in child care are more likely to come in contact with a range of biological hazards such as measles, mumps and rubella, rather than other chemical or physical hazards such as industrial solvents or workshop equipment (DETIR 1999). Therefore, based on the present data and previous research it appears that there is a need to improve awareness and education of all workers (Ferson 1993, 1997; Hanna 1993; Hanna & Brookes 1994; Jacques et al. 1994; Smith et al. 1997; Tallis et al. 1996; Thomson et al. 1998). Some suggested methods are staff meetings, newsletters, brochures and training and information sessions for both child care workers and parents.

5.12 Maintenance of Staff Records

Only one centre reported having an immunisation policy in place, while a further ten centres (71.4%) did not update that information on a regular basis. Three centres (21.4%) retained both records of hepatitis A and hepatitis B for staff. However, those three centre directors that reported maintaining staff records of immunisation of hepatitis A and B also significantly rated their belief in the importance of immunisation for both hepatitis A and B as high, that is: 'important' or 'very important'. Management at one centre stated it was in the process of purchasing computer software to assist with control of the task, while three other centres relied on staff members to self report to management any changes to their status.

Non-maintenance of child care workers' records was found in 71.4% (10/14) of participating centres. This finding is noteworthy, considering the

higher level of non-immunisation policy compliance by 92% of LDC's in the study. However, this is in distinct contrast to the finding that 92.9% or 13 of the participating centres maintained records of the children in their care.

Table 5.12.1: Tabulated comments to the question 'How regularly do you update staff records?'

RESPONSES	COUNT (n = 14)	% 'AGES
Staff records kept	4	28.6
No records kept	10	71.4
RECORDS UPDATE	**COUNT (n=14)**	**% 'AGES**
When informed	2	14.3
To purchase software	1	7.1
2 years	1	7.1
Annually	1	7.1
As required	1	7.1
Nil comment	8	57.1
TOTAL	**14**	**100**

Of the centre directors who completed the survey, only 42.8% (6/14) made a range of comments about how regularly they updated their staff records, as tabulated at Table 5.12.1. There were eight directors (57.1%) who did not offer a comment, suggesting that either they genuinely did not know, they were not aware of requirements or just did not wish to respond.

From Table 5.12.1, those eight directors who did not make comment about updating their staff records also similarly reported not maintaining records at all. However, two centres that did not keep records, did make comments that they either: 'encourage staff to keep them informed' or 'leave to staff to decide for themselves (but cost is a factor)'. This further suggests a need for increased

awareness training in relation to accurate record keeping in order to fulfil legislative obligations as well as comply with NHMRC recommendations, Principles 39, 44 & 47 of the NCAC for quality standards of care and Queensland Health Policy (1999) for child care workers (NCAC 1993; DWHS 1999; NHMRC 1997, 2000). In their research investigating staff immunisation records, Thomson et al. (1998) similarly found only 17% (16/95) of centres recorded staff immunisation status, and that these records were generally not updated. Further, of those who did record staff immunisation, only 57% recorded hepatitis A immunisation, but 100% of hepatitis B immunisation.

While this study reported only four centres (28.6%) maintaining staff immunisation records, only three (21.4%) of these centres actually kept documented records specifically showing the hepatitis A and hepatitis B status of their staff. On the other hand, 13 out of 14 centres (92.9%) kept records on the immunisation status of children, with three (30%) and eight (80%)of centres respectively showing the children's status of hepatitis A and hepatitis B. Moreover, these results are again at odds, suggesting either an inconsistent approach to administration of immunisation records or an apparent lack of awareness of the relevant requirements. This study also found that those child care centres which recorded staff immunisation, and in particular hepatitis A, were less likely to have child care workers who were vaccinated against hepatitis A. The research of Thomson and others in 1996 reported similiar findings across child care centres in Victoria (Thomson et al. 1998).

As previously mentioned, immunisation is one of a number of important strategies in controlling risks of infection from vaccine preventable diseases. While other strategies include hand washing, general hygiene and separating children into age groups, it is immunisation that is the cheapest and most reliable method of providing the human body with immunity against foreign organisms (DHSH 1994). This is achieved by giving the body a memory of

infection without the risk of natural infection (DHSH 1994; Lee & Bishop 1997). Therefore, documenting the immunisation status of staff is a significant step toward fulfilling a centre's WHS obligations to employees, customers, members of the public and the community.

The keeping of both immunisation records and vaccination schedules in either card or electronic form can be a factor in preventing the spread of infection, as they indicate quite specifically whether a centre's approach to infection control is professional and working. Bailey (1997) also records her support in her study of immunisation in general practice, stating that computer based immunisation registers were only effective tools if they were up to date and contain a complete set of all immunisations administered. The recording of all eligible children was also considered a key prerequisite to system effectiveness (Bailey 1997; NHMRC 1997, 2000). Records also assist with the obligatory requirements under both WHS and child care legislation in Queensland, as they provide documentary evidence to public health authorities in the event of outbreaks.

Additionally, and just as important for centre management, records are invaluable to the centre director for assisting with the identity of possible causes of an outbreak, how to control it and if the approach to infection control is working (DHSH 1994). Moreover, it is difficult for centre directors to exclude staff and children as a control measure during an outbreak, when full immunisation status is not fully known or documented. Risk control decisions by management become inefficient and haphazard when comprehensive information is not to hand. Based on the present data and previous research, a shortfall does exist in relation to training on these relevant statutory requirements and implementation in practice (Bailey 1997; Thomson et al. 1998). Furthermore, the study suggests that there maybe a need for increased awareness and education programs for recording and acting upon deficiencies in

staff immunisation status, thereby implementing the recommendations of various government authorities including the NHMRC, the Queensland DWHS 1999 audit findings and DHSH (DHSH 1994; DWHS 1999; NHMRC 1997, 2000).

5.13 Maintenance of Children's Records

From the current study, approximately 93% of LDC centres in the Bundaberg region maintained records of the children's immunisation status. The keeping of those records did not appear to be related to: (a) how the centres were managed; (b) whether the centre was sponsored; (c) the location of the centre and (d) whether the centre had a policy covering immunisation issues. However, using Cochran's correction factor for continuity and Cramer's *phi* coefficient (ϕ^2) for correlation it was determined there was an association between keeping of children's records and the number of days centres were open per week (χ^2 corrected = 6.982; $\phi^2 = +1$).

Whilst all centres reported they generally updated and maintained records of immunisation for children (13/14), it would appear from the findings an inconsistency in approach to record keeping between staff and children's records. Centre management needs to address each particular vaccine preventable disease with equal importance. This would then ensure that administering all immunisation records conforms with relevant legislation and Principles 39, 43 and 44 for Quality Care (NCAC 1993). These results also suggest a tendency for directors and perhaps parents to a degree, to adjudge hepatitis B as a more significant immunisation issue for their children, as 80% of centres recorded hepatitis B status as opposed to 30% of centres reportedly recording hepatitis A immunisation of the children in their care. This inference is further supported by the study's findings of a higher perception by workers of risk of hepatitis B (90%) than hepatitis A risk (77%).

Only one centre had an immunisation policy in place at the time of survey, while four centres kept staff immunisation records but 13 centres maintained children's records. In the current study, it would appear that while the majority of centres maintained childrens records, only one centre stated they updated those records on a monthly basis, as tabulated at Table 5.13.1.

Table 5.13.1: Tabulated comments and counts to the question of children's immunisation records.

RESPONSES	NUMBERS (n = 14)	% 'AGES
Children's records kept	13	92.9
No records kept	1	7.1
RECORD UPDATES	**NUMBERS (n = 14)**	**% 'AGES**
Annually	2	14.2
6 monthly	3	21.4
3 monthly	1	7.1
On parents advice	1	7.1
On going	1	7.1
Monthly	1	7.1
Nil comment	5	35.7
TOTALS	**14**	**100**

This data does not appear to reflect full compliance with the relevant requirements. The implied frequency stated in the *Australian Immunisation Handbook* by NHMRC is monthly (NHMRC 1997, 2000). Two other centres reportedly updated either on an on-going basis or as advised by parents. However, of the remainder, five reported they were not checking records at a frequency which would enable timely advice to parents of the due date for their child's vaccination(s) or made no comment at all. Table 5.13.1 also illustrates considerable variations in the frequency of those reported updates ranging from

on-going, three monthly, six monthly, annually or as advised by parents. Comments about their record updating process were not made by five centres, possibly indicating that they either didn't know, didn't wish to respond or don't update.

The maintenance of up-to-date and accurate registers of immunisations of children are specific functional requirements of directors under the Child Care (Child Care Centres) Regulation 1991 of Queensland, Regulation 34 (2) (g) (DFYCC 1991). Inadequate and poor recording keeping is not only a breach of these statutory requirements but it also makes it extremely difficult for staff to exclude immunised children from a particular child care setting, age group or play area when there is a communicable disease outbreak or a reported case of a vaccine preventable disease.

Adherence to vaccination schedules for both children and staff, on-going monitoring of those records and encouraging appropriate vaccinations are important strategies in minimising the spread of infection. As with staff immunisations, children's records show when a centre's approach to infection control is working and assists local public health authorities to identify causes of outbreaks and how to control and minimise further transmission. Under WHS legislation, such strategies and systems by employers provide visible evidence of commitment toward fulfilling obligations to employees, visitors and customers (such as parents and relatives) alike (DWHS 1995). From these results it would appear that the record of immunisations at centres is far from complete.

5.14 Summary

In summary, this Bundaberg regional survey determined that in long day care centres, child care worker immunisation for hepatitis A was associated with awareness of the NHMRC recommendations for child care centre staff caring for

children wearing nappies to be immunised against hepatitis A, with immunisation against hepatitis B and whether they reported their immunisation status when commencing work with their current employer.

Overall, while the actual numbers of reported hepatitis A immunised workers were less than the number of workers immunised for hepatitis B in the same workplace setting, the reported levels of general workplace health risk awareness by surveyed workers was high. However, immunisation against hepatitis A was low and suggests a concern. Both NHMRC and others advise of the occupational risks in child care settings for workers and of the increased risks to workers who are involved with nappy wearing children (Hadler et al. 1980; Hadler & McFarland 1986; Jacques et al. 1994; NHMRC 2000; Staes et al. 2000; Stapelton 1999; Tallis et al.1996). As recent as April 2001, Amin, Gilbert, Escott, Heath and Burgess (2001) report that despite the susceptibility to infection amongst the Australian population, hepatitis A vaccine uptake is still inadequate. They recommend a national assessment be undertaken for high risk occupational groups.

Previous immunisation against hepatitis B was reported higher than hepatitis A for workers. However, those child care workers immunised for hepatitis A were also associated with immunisation for hepatitis B. Furthermore, hepatitis A immunisation was found to be associated with the individual worker's risk perception of catching hepatitis A infection from the children in their care. Chi-tests for association also confirmed that there was a relationship between a worker's perception of the risks of contracting hepatitis A infection from children and their perception of the risks of hepatitis B infection from the child care setting. Also, it was determined that a significant association did exist between the surveyed worker's risk belief of hepatitis A over workers from other industries and also their risk belief of hepatitis B over workers from industries other than child care.

On the other hand, hepatitis A immunisation levels amongst surveyed child care workers was not associated with either worker employment categories, the age of respondent workers or their qualifications. There was also no statistical association with the frequency of workers changing children's nappies, experiences of having suffered or been diagnosed with hepatitis A, and attendances at training or education sessions on immunisation related issues. No statistical association was seen between the uptake of hepatitis A immunisation and with the recognition of hepatitis A virus symptoms, worker's risk belief for workers outside the child care industry and awareness of the availability of the hepatitis A vaccine.

It would appear from the current study and previous research, that many workers perceived their occupation placed them at increased risk compared to the community and that most were aware of the availability of hepatitis A vaccine (Thomson et al.1998). The research suggests that the attitudes, beliefs and practices of centre directors was also a determining factor in vaccination uptake by workers. The present data also questions the effectiveness of the NHMRC recommendations and their impact on risk management at the workplace. The study highlighted that there was some confusion amongst workers and directors about the risks of hepatitis A and hepatitis B infection. For those at occupational risk, confusion about the various levels of infection risk suggests an important topic area for inclusion in future training programs.

From the perspective of centre management, this study found there was no association between LDC centres with an immunisation policy and (a) the directors' perception of the importance of immunisation against both hepatitis A and hepatitis B, (b) how the centre was managed, (c) the retention of staff immunisation records and (d) the retention of immunisation records of the children in their care. Only 28% of the participating centres kept staff

immunisation. However, where those centres did maintain records, less than half (42.9%) subsequently showed the hepatitis A immunisation status of their child care staff on their documents. Adoption of a process for managing workplace health and safety is a legal requirement. Documentation is a key element of proof of such a system.

The present study identified inconsistent and poor policy management and documentation, and non-compliance at the time of survey with relevant legislation and authorities. These findings were consistent with Thomson et al. (1998) and suggests emphasis on educating all staff on vaccination, hygienic practices, infection control and policy requirements. This study's findings corroborates the results of previous research (Thomson et al. 1998). They also suggested linking child care centre accreditation with immunisation policy, completeness of records and status of both children and staff.

Organisational culture within the child care setting is the sum of attitudes, beliefs, expectations, actions and behaviours of all involved (Caton & Roche 1999). Apart from a demonstrated committed by management, a strong culture of WHS is achieved by increasing staff awareness through the provision of information, instruction and training. This can be done by promoting specific training in areas such as first aid, hazard identification, assessment and control, standard precautions, policy and procedures, hygienic practices, record keeping and knowledge of child development

Overall, this study gathered information into risks associated with a particular WHS issue that exists in the child care industry. The results from this replicated study were not that dissimilar to the Victorian study by Thomson et al. (1998). This suggests there are many identical needs to be addressed by stakeholders, despite different requirements of the regulations for child care services between the two States.

CHAPTER 6

CONCLUSIONS and RECOMMENDATIONS

6.1 CONCLUSIONS

The purpose of this current study was to evaluate the self-reported hepatitis A immunisation pattern amongst child care workers in long day care centres in the Bundaberg community. The study aimed to assess the knowledge and practices relating to staff immunisation including whether centre management and workers were aware of and had followed through with the NHMRC recommendations for workers in child care settings to be immunised for hepatitis A.

There were two important findings from this research. First, the study found that self-reported levels of hepatitis A immunisation amongst long day care centre workers was poor suggesting that the surveyed centres may not be meeting the standards for immunisation of workers as set by the NHMRC. Secondly, from the results it would appear that there are also identified deficiencies in training and education about many risk management processes relating to infectious disease control and contemporary immunisation issues, particularly hepatitis A. Therefore, the outcomes of this investigation support the hypotheses advanced within the aim of the study.

Further, this current study documented that there was a lack of awareness of risk factors associated with hepatitis A in the long day care setting. Such findings may have implications for centre managers and public health

authorities, more specifically in relation to identfying hazards in such areas as waste disposal, hygiene and cleansing programs. The findings also identified a pattern of on-going misconception about greater risks of hepatitis B than hepatitis A in contemporary child care settings. The current study documented evidence that was indicative of inconsistent record keeping of both staff and children's immunisation records at surveyed long day care centres in the Bundaberg area .

Moreover, it was also apparent that health issues relating to hepatitis A and B within surveyed child care centres tended to focus on the well being of the children, whilst neglecting some of the very same workplace health and safety rights of the staff. These results suggests a lack of awareness of mandatory obligations under Queensland Workplace Health and Safety Act and Regulations (DWHS 1995) and Child Care Act and Regulations (DFYCC 1991) by both centre directors and child care workers. In conclusion, the study gathered a range of information about contemporary long day care settings and established guidelines for the implementation of future benchmarks for the industry.

6.2 RECOMMENDATIONS

The results from this study suggest a need for timely implementation of education and training initiatives on hepatitis A infection issues. Such initiatives would include the adoption of training induction programs for new staff that include hepatitis A immunisation issues, training in contemporary safe work practices and procedures using workshops or working groups, and introduction of annual refresher training on infection control. Further, that copies of the latest editions of the *Australian Immunisation Handbook* be made available regularly to all child care centres as an important source of appropriate information. This would ensure the dissemination of the recommendations of the NHMRC for both staff and parents.

These findings also suggest the setting up of a consultative working committee representing all local day care centres in the area, together with health authorities and other key stakeholders to develop, implement and monitor a range of such strategies. This recommendation would be a useful and meaningful way of addressing areas of concern identified in the study. The resources, responsibilities and costs of training initiatives overseen by this committee are therefore shared and not seen as the sole responsibility of management or the employer (s) at one particular day care facility. It would also ensure training consistency and equity in the process across the region.

This study also proposes linking child care centre license classification and approvals as decreed by relevant authorities, with levels of compliance of both staff and children's immunisation. That is, the granting and renewal of the actual child care license to a facility should be dependent upon their overall immunisation compliance level. This may serve to encourage employers to rectify immunisation deficiencies amongst their staff, enhance vaccination uptake and ensure adherence with NHMRC guidelines. This could be done either through local government, community health or other statutory authorities. Another important consideration that emanates from this research is that perhaps there is also a need to provide the right supportive environment in the workplace if the various stakeholders are to encourage immunisation compliance in both workers and employers.

A proposal of this nature would require Federal government input and funding for administration, and to implement a methodology to accommodate variances to the levels of compliance for such a centre licensing system. Another addition to this proposal would be to include staff immunisation as part of the accreditation review process by the National Childcare Accreditiation Council.

6.3 DIRECTIONS FOR FUTURE RESEARCH

Future research involving replication of the present study, with greater participant numbers using, for example Computer Assisted Telephone Interview (CATI) survey techniques and randomised sampling, may further help clarify the exact picture of hepatitis A issues in the Wide Bay Burnett child care community. Findings from the present study suggest that future research in this particular area of workplace health and safety, with emphasis on immunisation issues for child care workers, would benefit the various stakeholders in the local Bundaberg area.

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Appendix 1

Child Care Worker Questionnaire

CHILD CARE WORKER QUESTIONNAIRE

Study No. _____

Job Classification/Description of Position : _____

Gender: Male ❒ Female ❒

This survey is designed to gather information about experiences with Hepatitis A and B and associated workplace risk factors amongst workers at child care centres in the Bundaberg district.

What is the answering procedure?

There are no *right* or *wrong* or *best* answers to any of the questions. I ask only that you answer each question as factually as possible. If you feel unsure about how to answer a question, please give the closest response. If you do not wish to answer a question, please leave it blank.

Your responses and personal information are completely confidential. There will be no names on any of the survey forms – just a number known only to you and the researcher. No one else need even know you are a part of the project unless you choose to tell them. The study's findings will be reported collectively.

What does being part of the project mean to me?

At this stage, you are asked to:-

- Read and sign the consent form attached;
- Fill in the survey form. This should take about 15 minutes;
- Centre Directors / Coordinators are also asked to complete a worker survey.

What if I don't want to be part of the project?

You are free to advise if you do not wish to take part in the project or to withdraw at any time and be assured of no further contact.

Where can I get more information?

If you would like more information relating to the project, please call me during normal business hours.

Mr. P.J. Fleming
Student
PO Box 2903
BUNDABERG QLD 4670

Phone: (07) 41 505 511 (W)

QUESTIONS TO CHILD CARE WORKERS

1. What category of child care worker do you belong to? (please circle one option)

   1. Qualified child care worker (eg. Associate Diploma, Certificate III etc.)
   2. Unqualified child care worker (eg. Child Care Assistant)
   3. Other, please specify _____

2. How many years have you worked in children's services? _____years

3. Please indicate your age group? (circle one option)

   1. 16 - 19 years
   2. 20 - 24 years
   3. 25 - 34 years
   4. 35 - 44 years
   5. 45 - over

4. Are you: (please circle one option)

   1. Female
   2. Male?

5. What is your country of birth? _____

6. How would you currently describe your health? (please circle one option)

   1. In good health
   2. Feel fit and well most of the time
   3. Healthy enough to do what I want to do
   4. Tired by the end of work for the day
   5. Dragging myself to get through the day

7. How many years have you worked in this child care centre? _____years

8. Do you work here: (please circle one option)

   1. Full time
   2. Part time
   3. Casual (eg. Hired from a child care agency)?

9. How many hours per week do you **usually** work as a child care worker?
_____per week.

10. What age group of children do you usually work with? (please circle one option)

1. Less than 2 years old
2. Two to three years old
3. Three years and older
4. Mixed age group (eg. 0 to 5 years old)
5. Other, please specify _____

11. How often do you care for children who wear nappies while at the centre? (please circle one option)

1. Daily
2. Weekly
3. Rarely
4. Never
5. Other, please specify _____

12. How often do you change children's nappies at the child care centre? (please circle one option)

(i)
1. Daily
2. Weekly
3. Rarely
4. Never
5. Other, please specify _____

(ii) Please describe the procedure used. _____
_____
_____
_____

13. (i) Were you asked if you were immunised when you commenced work with your current employer? (please circle one option)

1. Yes
2. No
3. Don't know

If "No" please go to question 14.

(ii) Does your employer organise and pay for you to be immunised? (please circle one option)

1. Yes
2. No
3. Don't know

THIS SECTION OF THE QUESTIONNAIRE IS ABOUT HEPATITIS A.

Symptoms of viral hepatitis include jaundice (skin going yellow), nausea, fever and abdominal pain.

14. Have you suffered from any or all of these symptoms during the time you have been working in child care? (Please circle one option)

    1. Yes
    2. No
    3. Don't know

15. Have you ever / or are you suffering from viral hepatitis? (please circle one option)

    1. Yes
    2. No
    3. Don't know

Hepatitis A is an infectious disease transmitted by the faecal-oral route. Young children with the infection usually have few, if any, symptoms.

16. Prior to receiving this questionnaire, did you think you were at risk from catching hepatitis A from the children in your care? (please circle one option)

    1. Yes
    2. No
    3. Don't know

17. Is this risk higher for you, than for someone not working in child care? (please circle one option)

    1. Much more likely
    2. More likely
    3. About the same
    4. Less likely
    5. Much less likely

18. Have you ever been infected with the hepatitis A virus? (please circle one option)

    1.Yes
    2. No
    3. Don't know

19. Prior to receiving this questionnaire, did you know that immunisation against hepatitis A was available? (please circle one option)

    1. Yes
    2. No

20. Prior to receiving this questionnaire, did you know that the National Health and Medical Research Council recommends that child care centre staff caring for children wearing nappies should be immunised against hepatitis A? (please circle one option)

    1. Yes
    2. No

The hepatitis A vaccine has been available since mid-1993 and usually consists of three (3) injections over a period of about six (6) months.

21. (i) Have you been vaccinated against hepatitis A? (please circle one option)

    1. Yes
    2. No
    3. Don't know

If "No" or Don't Know", please go to question 22.

(ii) Why did you choose to receive the hepatitis A vaccine? (please circle one option)

1. Travelling overseas
2. At occupational risk due to working in the child care setting
3. Other, please specify _____

(iii) Who arranged for you to be vaccinated against hepatitis A? (please circle one option)

1. General Practitioner or other Health Professional
2. Training Institute or College
3. Employer
4. Local Council
5. Community Group
6. Other, please specify _____

(iv) Who paid for the cost of the hepatitis A vaccine? (please circle one option)

1. You
2. Your employer
3. Other, please specify _____

Please go to question 23.

22. If you have **not** been vaccinated against Hepatitis A, please circle the reason which best describes why you have not.

1. Previous hepatitis A infection
2. Advise from a doctor not to be immunized (due to allergic reactions etc..)
3. Unaware that hepatitis A immunization was available
4. Unaware of the risks of contracting hepatitis A
5. Thought immunization was dangerous
6. Cost of immunization
7. Don't like injections or needles
8. Other, please specify _____

THIS SECTION OF THE QUESTIONNAIRE IS ABOUT HEPATITIS B.

Hepatitis B is an infectious disease. The virus is mostly found in the blood of an infected person and can be transmitted in the child care setting through contact with body fluids (saliva/mucous), nicks, cuts and open sores.

23. Prior to receiving this questionnaire, did you think you were at risk from catching hepatitis B from infected persons in a child care setting? (please circle one option)

    1. Yes
    2. No
    3. Don't know

24. Is this risk higher for you, than for someone not working in a child care setting? (please circle one option)

    1. Much more likely
    2. More likely
    3. About the same
    4. Less likely
    5. Much less likely

25. Prior to receiving this questionnaire, were you aware that immunisation against hepatitis B was available. (please circle one option)

    1. Yes
    2. No

The hepatitis B vaccine has been available since the mid-1980's and usually consists of three (3) injections over a period of a few months.

26. **(i)** Have you been vaccinated against hepatitis B? (please circle one option)

    1. Yes
    2. No
    3. Don't know

If "No" or "Don't know" please go to Question 27.

(ii) Have you had a blood test to check whether you responded to the vaccine? (please circle one option)

1. Yes
2. No
3. Don't know

(iii) Why did you choose to receive the hepatitis B vaccine? (please circle one option)

1. Travelling overseas
2. At occupational risk due to working in the child care setting
3. Other reason (please specify) _____

27. **(i)** Have you ever attended courses or training about staff immunisation? (please circle one option)

1. Yes
2. No

If "No" please go to question 28

(ii) Where did you attend the courses or training sessions and what topics were covered? (please include the year you attended the course)

Year	Where was the Course	Topics Covered
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

28. Please write any comments you would like to make about this questionnaire or the issues it raises in the space below.

_____

_____

_____

THANK-YOU FOR COMPLETING THIS QUESTIONNAIRE.

Appendix 2

Child Care Directors' Questionnaire

CHILD CARE DIRECTOR / COORDINATOR QUESTIONNAIRE

Study No. _____

Job Classification/Description of Position : _____

Gender: Male ❒ Female ❒

This survey is designed to gather information about experiences with Hepatitis A and B and associated workplace risk factors amongst workers at child care centres in the Bundaberg district.

What is the answering procedure?

There are no *right* or *wrong* or *best* answers to any of the questions. I ask only that you answer each question as factually as possible. If you feel unsure about how to answer a question, please give the closest response. If you do not wish to answer a question, please leave it blank.

Your responses and personal information are completely confidential. There will be no names on any of the survey forms – just a number known only to you and the researcher. No one else need even know you are a part of the project unless you choose to tell them. The study's findings will be reported collectively.

What does being part of the project mean to me?

At this stage, you are asked to:-

- Read and sign the consent form attached;
- Fill in the survey form. This should take about 15 minutes;
- Centre Directors / Coordinators are also asked to complete a worker survey.

What if I don't want to be part of the project?

You are free to advise if you do not wish to take part in the project or to withdraw at any time and be assured of no further contact.

Where can I get more information?

If you would like more information relating to the project, please call me during normal business hours.

Mr. P.J. Fleming
Student
PO Box 2903
BUNDABERG QLD 4670

Phone: (07) 41 505 511 (W)

QUESTIONS TO CHILD CARE CENTRE CO-ORDINATORS & PROPRIETORS

1. How is your centre managed? (please circle one option)

    1. Community Based
    2. Privately
    3. Other, please specify _____

2. (i) Does your centre have a sponsor? (please circle one option)

    1. Yes
    2. No

If "No" please go to Question 3.

(ii) Who is your centre's sponsor? (please circle one option)

1. Educational Facility (e.g. University, TAFE)
2. Hospital
3. Charity
4. Church
5. Sports group
6. Other, please specify _____

3. Which area best describes where your child care centre is located? (please circle option)

    1. Bundaberg City area
    2. Burnett Shire
    3. Other rural area
    4. Other _____

4. What category is your centre? (please circle one option)

    1. Long day child care centre
    2. Family day care
    3. Kindergarten
    4. Preschool
    5. Outside school hours care
    6. Limited hours and occasional care
    7. Adjunct Care (such care provided in shopping centre/gym)

5. How many days per week is your centre open? (please circle one option)

    1. Five or more days per week
    2. Three to four days per week
    3. Less than three days per week

6. How many hours per day is your centre <u>usually</u> open for children? _____ hours

7. How many places is your centre licensed for? _____ places

8. How many children do you care for in an average week? (please state for children attending full time <u>and</u> part time)

    _____ children attend full time in an average week

    _____ children attend part time in an average week

9. From **youngest** to **oldest**, what is the range of ages of the children at your centre? (please answer in years and month)

    From _____ (**youngest**) to _____ (**oldest**)

10. (i) Are the children separated into age groups? (please circle one option)

1. Yes
2. No

If "No" please go to question 11.

(ii) When you are operating at peak capacity, how many children are usually in each age group? (please list numbers of children)

1. 6 weeks to 15 months _____
2. 15 months to 2.5 years _____
3. 2.5 years to 3.5 years _____
4. 3.5 years to 5 years _____

(iii) Are the children separated into age groups? (please circle one option)

1. All day (i.e. they never mix)
2. Most of the day (e.g. except early morning and late afternoon)
3. About half the day
4. Only during specific activities, please specify _____
5. Other, please specify _____

(iv) Are 2 year old and 3 year old children always in the **same** age grouping?

1. Yes
2. No

11. (i) How many children in care on an average week still wear nappies while at your centre?

_____ children still wear nappies

(ii) Do you consider this excessive under current staffing arrangements? (please circle one option)

1. Yes 2. No 3. No opinion

12. How often are the toilet-trained children separated from those still wearing nappies? (please circle one option)

    1. All day (i.e. they never mix)
    2. Most of the day (e.g. except early morning and late afternoon)
    3. About half the day
    4. Only during specific activities, please specify _____

    _____

    5. Never
    6. Other, please specify _____

13. Are toys shared between the toilet-trained children and those still wearing nappies? (please circle one option)

    1. Yes
    2. No

14. Is there a separate area for nappy changing? (please circle one option)

    1. Yes
    2. No

15. Do you have established procedures / routines for the following? (please circle)

1.	Hand washing before snacks/meals	Yes	No
2.	Food preparation	Yes	No
3.	Water/drinking fluid preparation	Yes	No
4.	Nappy changing	Yes	No
5.	Toileting	Yes	No
6.	Safe disposal of faeces	Yes	No

    (Please attach a copy of procedures, if available)

16. How many contact staff (those that directly care for the children) do you employ in a normal month? (please complete for full time, part time and casual staff)

    _____ full time staff

    _____ part time staff

Continued over.....

_____ casual staff (e.g. relieving staff)

17. Does your centre have a policy regarding immunisation for childcare workers? (please circle one option)

    1. Yes
    2. No

If "YES" could you please attach a copy of your centre's policy.

18. Prior to receiving this questionnaire, how important did you think it was that child care staff be immunised against hepatitis A? (please circle one option)

    1. Not at all Important
    2. Somewhat Important
    3. Important
    4. Very Important

19. Prior to receiving this questionnaire, how important did you think it was that child care staff be immunised against hepatitis B? (please circle one option)

    1. Not at all Important
    2. Somewhat Important
    3. Important
    4. Very Important

The next question relates to you and your staff.

20. (i) Do you keep records on the immunisation status of your *staff?* (please circle one option)

    1. Yes
    2. No

If "No" please go to Question 21.

(ii) How regularly do you update them? _____

Continued over.....

(iii) Do your records include immunisation status against the following? (please circle appropriate options)

Hepatitis A	1. Yes	2. No
Hepatitis B	1. Yes	2. No

The next question relates to the children.

21. Do you keep records on the immunisation status of the *children* in your care? (please circle one option)

    1. Yes
    2. No

If "No" please go to Question 22.

(ii) How regularly do you update them? _____

(iii) Do your records include immunisation status against the following? (please circle appropriate options)

Hepatitis A	1. Yes	2. No
Hepatitis B	1. Yes	2. No

In your records, you keep many details about the children enrolled at your centre.

22. Do you record any of the following details? (please circle appropriate options)

Mother's country of birth	1. Yes	2. No
Father's country of birth	1. Yes	2. No
Childs country of birth	1. Yes	2. No

23. Please write any comments you would like to make about this questionnaire or the issues it raises in the space below.

_____

_____

_____

_____

Please remember to attach copies of your centre's policy on staff immunisation and procedures as requested.

THANK-YOU FOR COMPLETING THIS QUESTIONNAIRE.

Appendix 3

Covering Letter and Consent Form

for Survey Participants

P.J. Fleming
22 Croft Street
BARGARA QLD 4670

Phone : (07) 41 505511(W)

2nd August, 1999.

The Director,
Child Care Centre,
..... Street,
Bundaberg QLD, 4670

Dear .....,

Request for Assistance and Support for Research

I am a student on the Master of Occupational Health and Safety program at Central Queensland University, Rockhampton undertaking a study of the status of hepatitis immunisation amongst child care workers. My research project is based on experiences within Queensland workplaces, more specifically the Bundaberg region.

The aim of the study is to seek information about the awareness of health authority recommendations for immunisation of child care workers and the level of awareness in the Bundaberg region. A brief profile description of the study is attached. The project has received ethical clearance from the Central Queensland University Human Ethics Research Review Panel.

My supervisors are Professor Trevor Arnold (07) 49 309 706 and Ms. Robin Ray (07) 49 306 537 at the Faculty of Arts, Health and Sciences at the Rockhampton Campus. They can be contacted if you have any concerns about the project.

I would appreciate your assistance with this research. In particular, I am seeking support for both the co-ordinators and child care workers to be surveyed by self administered questionnaire. This should only take approximately fifteen (15) minutes.

All participants are assured of confidentiality as individuals will not be named, information will only be coded. All information will be combined for analysis thereby ensuring that individuals cannot be identified.

At the conclusion of the study, findings and practical recommendations will be forwarded to participating organisations, if requested. Papers are also to be prepared for the Australian Journal of Early Childhood.

Should you have any queries regarding this project, you may contact me on (07) 41 505 511 (W).

I will phone you in approximately one (1) week to discuss your participation in the research.

Thanking you in anticipation of your support.

Yours faithfully,

_____

Peter "PJ" Fleming.

Attachment

RESEARCH PROJECT

1. THE PROJECT:

Topic: *A study of the status of Hepatitis immunisation in child care workers – a cross sectional study of day care centres in the Bundaberg community.*

Researcher: *Peter (PJ) Fleming, Grad. Dip. OHS. (CQU)*

2. DESCRIPTION OF RESEARCH PROJECT:

A. Aims of the Research Project

This study aims to evaluate the current level of immunisation of child care workers in the Bundaberg community. This will be achieved by:

(i) Identifying the levels of self reported immunisation status of child care workers in relation to hepatitis A and B;

(ii) Evaluating the levels of awareness of NH & MRC recommendations for immunisation amongst both child care centre coordinators and child care workers;

(iii) Ascertaining if changes in training and educational initiatives are needed to achieve improvements in health and safety performance for child care centre staff;

(iv) Identifying for any association between length of employment, age, education/training and types of work performed and occupational risk of infection;

(v) Examining factors such as evidence of a centre's immunisation policy and coordinators beliefs that may determine staff awareness of immunisation issues; and

(vi) Reviewing the effectiveness of current community health immunisation programmes.

A. Procedure

Child care centres in Bundaberg, Bargara, Childers and Gin Gin will be involved in a cross sectional study to establish the current levels of hepatitis immunisation in child care workers. Staff comprising Directors, Co-Ordinators, Child Care Workers and Assistants, Administration and Support Staff will be surveyed by self administered questionnaires.

Coordinators will be surveyed for characteristics of the centre and policy implementation, whilst other staff will be asked for information regarding immunisation issues and immunisation status.

3. FORESEEABLE RISKS FOR SUBJECTS:

This project will not endanger any participant, either physically or emotionally.

4. FORESEEABLE BENEFITS:

This study will help to develop further knowledge about the awareness of health authority recommendations for immunisation of child care workers in the Bundaberg community as well as the current immunisation status of those workers. Child care workers, as an occupational hazard, face the risk of contracting infectious diseases from the children under their care and from their work colleagues. Further, this study will examine whether those health authority recommendations have been implemented. Such information will be useful for planning training and education programmes and determining the effectiveness of current community health protocols.

It is expected to benefit not only those participating child care centres, but regional Health Units and local Councils as well as other bodies such as the Australian Journal of Early Childhood and Institutes of Early Childhood and Family Studies.

5. CONFIDENTIALITY:

No names of individuals or organisations will be recorded on any questionnaires. Data collected will be secured in a locked facility. All information will be combined for analysis, so individuals cannot be identified.

6. PARTICIPATION:

Each person's participation is voluntary and will not be coerced in any way. They may withdraw from the study at any time.

7. ANY MATTERS OF CONCERN:

Please phone Mr. Peter Fleming on (07) 41 505 511 (W) during business hours if you have any concerns whatsoever about the project. You may also contact Professor Trevor Arnold (07) 49 309 706 or Ms. Robin Ray (07) 49 306 537, Lecturers at the Faculty of Arts, Health and Science, Central Queensland University, Rockhampton.

8. FEEDBACK:

An executive summary of the findings from the research project will be provided to child care centres participating in the study, if requested. If you would like a personal copy, please call Mr. Peter Fleming (07) 4150 5511 sometime during 2000.

HEPATITIS IMMUNISATION STUDY CONSENT FORM

Peter 'PJ' Fleming
PO Box 2903
Bundaberg Qld 4670
Ph (07) 4150 5511
Fax (07) 4150 5410

In signing this document, I am giving my consent to be part of a research study that will examine the status of hepatitis immunisation in childcare centre workers. I understand that I was selected to participate in this study because I am employed to work in a childcare setting. This study will help develop a better understanding of the current awareness of immunisation requirements of childcare workers and childcare centre co-ordinators. Such information will be useful planning relevant training and education programs.

I acknowledge that participation involves about fifteen (15) minutes of my time in responding to a questionnaire and that my answers to questions will remain confidential to the study and the study's findings will be reported as a group. I understand that responding to the questionnaire is entirely voluntary and that I can refuse to answer specific questions or terminate at any time.

I am also aware that my participation, non-participation or refusal to answer questions will not reflect on my family or my employment. I also understand that I will not receive monetary benefits as a result of my participation.

I acknowledge that a summary of the results of this research will be given to me if requested and that P.J. Fleming is the person to contact if I have any questions about the study or about my rights as a study participant. P.J. Fleming can be contacted on (07) 4150 5511.

Retain this portion

(Fold and tear along here)

I _____ agree to participate in the research described above by responding to the questionnaire. I understand that my name will not be used in any of the resulting reports.

Signed: _____ Date _____

[PLEASE PLACE IN SEALED ENVELOPE WITH QUESTIONNAIRE]
But do not attach to the questionnaire