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Estimating the impact of the next influenza pandemic on population health and health sector capacity in New Zealand
N Wilson, O Mansoor, M Baker

This study modelled the impact of the next influenza pandemic on population health and health sector capacity in New Zealand. The results give a range of 1600 to 3700 deaths, between 6900 and 16,200 hospitalisations, and up to 759,000 medical consultations from the first pandemic wave. Such modelling work has a number of limitations, but the potentially severe impact provides a strong case for health authorities to intensify preparatory efforts and to strengthen health sector infrastructure.

The New Zealand Hepatitis B Screening Programme: screening coverage and prevalence of chronic hepatitis B infection
T Robinson, C Bullen, W Humphries, J Hornell, C Moyes

This paper describes the New Zealand Hepatitis B Screening Programme and presents data on coverage and prevalence of carriage. Over 2 years (2000–2002), 177,000 people participated, with coverage highest among women and Pacific people. 10,176 (5.7%) had chronic infection and there were important regional, ethnic, and gender differences in prevalence, confirming estimates from smaller surveys. Opportunistic screening of adults in high prevalence groups will identify others. Follow up of people with chronic hepatitis B infection should continue, with outcomes monitoring to evaluate programme effectiveness.

High rates of chlamydia in patients referred for termination of pregnancy: treatment, contact tracing, and implications for screening
S Rose, B Lawton, S Brown, F Goodyear-Smith, B Arroll

High rates of chlamydia in women referred for termination of pregnancy are reported by Sally Rose and colleagues. Rates of infection are particularly high in under 25 year olds as well as Pacific and Maori women. These data add to mounting evidence of a chlamydia epidemic in New Zealand, and highlight the need for mandatory chlamydia testing in pregnant women. A protocol between referrers and TOP clinics that clearly outlines responsibilities for the detection and treatment of chlamydia, as well as contact tracing and follow-up, would help reduce the burden of infection.

Sexually transmitted infections in New Zealand in 2003
A Johnston, D Fernando, G MacBride-Stewart

New Zealand’s sexually transmitted infections (STIs) rate has been steadily increasing over the past few years. In 2003, sexual health and family planning clinics reported
that chlamydia was the most commonly diagnosed STI, followed by genital warts. In 2003, laboratory surveillance reported high rates of chlamydia and gonorrhoea. STIs were more common among young people and people of Maori or Pacific peoples ethnicity. Improving current surveillance methods to reflect all areas of New Zealand will provide accurate estimates of the population burden of STIs.

Is syphilis resurgent in New Zealand in the 21st century? A case series of infectious syphilis presenting to Auckland Sexual Health Service
S Azariah

Syphilis has been a relatively rare sexually transmitted infection in New Zealand since the middle of last century (1950). However, in the past few years, there has been a definite increase in the numbers of cases presenting to Auckland Sexual Health Service. Better surveillance is required for us to understand more about syphilis transmission in New Zealand. Those most at risk of acquiring syphilis appear to be either people who have sex overseas or men who have sex with men.

Findings and outcome of teenage women referred for colposcopy at Christchurch Women’s Hospital, New Zealand
P Sykes, D Harker, D Peddie

This study reviews the findings and outcome in teenage women with abnormal smears referred to the Christchurch Women’s Hospital Colposcopy Clinic. The vast majority of these women had low grade abnormalities, unlikely to progress to cervical cancer. Despite this, they underwent an average of four colposcopy examinations and most underwent treatment. In view of the fact that there is no proven benefit to cervical screening in this age group, it is not recommended.

The utility of blood cultures in the management of non-facial cellulitis appears to be low
A Stevenson, P Hider, M Than

Cellulitis or soft tissue skin infections are a relatively common condition treated at emergency departments in New Zealand; however, uncertainty exists among clinicians about the utility of taking blood cultures to assist with patient management. A multidisciplinary team at the Christchurch School of Medicine examined published research and concluded from their assessment of 17 previous studies that there was not good evidence to support the routine use of blood cultures in the management of patients with uncomplicated cellulitis at the emergency department.

Demographic variation in the use of antibiotics in a New Zealand town
P Norris, G Becket, D Ecke

The excessive use of antibiotics has led to the serious problem of antibiotic resistance. However little is known in New Zealand or overseas about who takes antibiotics. This study investigated the use of antibiotics in one New Zealand town. In 2002, 42% of
residents received prescription for antibiotics. We found that children were given antibiotics more than adults, females more than males, and people in poorer parts of town received more antibiotics than those in richer parts of town.

Tuberculosis in Auckland autopsies, revisited
D Lum, T Koelmeyer

Tuberculosis is still relatively common in some communities in New Zealand. In this study, we examine the cases of tuberculosis found at autopsy during the last 10 years in Auckland. A large proportion (70%) of these cases was not diagnosed until the autopsy was done. We explore the possible reasons for this, and discuss public health implications resulting from missed diagnoses. Raising awareness of tuberculosis is vital for preventing missed diagnoses.
New Zealand’s preparedness for the next influenza pandemic

Lance Jennings

Pandemic influenza is one of the most significant global public health emergencies. Since late 2003, the avian influenza A (H5N1) epizootic in Asia, which has affected both animals and humans, has brought the world closer to an influenza pandemic than at any time since 1968.1,2

Avian Influenza in Asia

Conditions favouring the emergence of a pandemic virus are increasingly being met. The H5N1 virus is now endemic amongst poultry in parts of Asia, has become increasingly pathogenic for poultry, and is expanding its host range. The virus has caused the death of tigers and domestic cats in Thailand and transmission between domestic cats has been demonstrated experimentally. Wild waterfowl are the natural reservoir for all influenza A viruses, however asymptomatic ducks have now been shown to excrete the highly pathogenic H5N1 virus, thus providing another source for infection.

H5N1 virus has been isolated from pigs on farms in China, fuelling concerns of the possible emergence of a novel virus from this source.3 Human cases have occurred in Thailand, Viet Nam, and Cambodia during the three waves of avian influenza. Probable human-to-human transmission has been reported in a family cluster in Thailand in September 2004,4 and additional family clusters have been identified in Viet Nam during January and February 2005, however sustained human-to-human transmission has not been demonstrated.

The WHO call for pandemic preparedness

Since this epizootic first came to the world’s attention in January 2004, the World Health Organization (WHO) has repeatedly encouraged all countries to undertake pandemic preparedness activities.5,6 The WHO held an international consultation in April 2004 on the public health interventions before and during a pandemic.7 This meeting drew extensively on the lessons learnt from the public health interventions used to contain the 2003 severe acute respiratory syndrome (SARS) outbreak. A second WHO consultation was held in December 2004, and recommended several revisions to the WHO preparedness plan for an influenza pandemic.6

The WHO plan presents a phased approach in which sequential epidemiological events trigger a range of international and national activities. Revisions focus on the inclusion of additional levels of alert and related activities needed when a pandemic threat arises from an outbreak in animals. The WHO, through its regional offices (WHO/WPR and WHO/SEAR), has been holding pandemic planning workshops and is contributing to the development of a pandemic-planning checklist.
Pandemic influenza in the previous century (1900–2000)

When looking at the past history of influenza, there is good reason to commit significant resources for global, national, and regional pandemic planning. Over the previous century (1900–2000) there have been three pandemics—beginning in 1918, 1957, and 1968. The 1957 Asian and 1968 Hong Kong pandemics caused large numbers of cases and a combined mortality estimated to be more than 3 million deaths—mostly in the very young, the elderly, and people with underlying chronic conditions. In contrast, the 1918–19 Spanish pandemic caused an estimated 50–100 million deaths, mainly in persons 15–35 years old.

Statistical modelling suggests that a future influenza pandemic will cause 2–7 million deaths worldwide. The current mortality rate of recognised human cases of avian influenza in Thailand and Viet Nam is ~70%. If there is a pandemic involving avian influenza, then deaths could be dramatically higher. The 2003 SARS outbreak gave the world a glimpse of the potential societal and economic disruption of such an event. As New Zealand has been affected by past pandemics, it would be unlikely to escape one in the future.

New Zealand’s Pandemic Action Plan

New Zealand has a pandemic action plan, which has been incorporated within the National Health Emergency Plan: Infectious Diseases. We are one of only five countries in the Asian-Pacific region with well-advanced pandemic planning and implementation—many countries are yet to start.

Indeed, pandemic planning has been a part of New Zealand’s influenza control strategy since the mid 1990s with the first preparedness plan being in place in 1999. Initiatives such as the national simulation exercise ‘Exercise Virex,’ and the utilisation of the plan as the framework for the national SARS response, have helped challenge the plan and have contributed to its evolution.

The establishment of the National Influenza Strategy Group (NISG) (to promote influenza awareness and the use of seasonal influenza vaccines), agreements for pandemic vaccine supply, and the recent establishment of a stockpile of the influenza antiviral oseltamivir, are all integral parts of the national strategy. However, the pandemic action plan must continue to be viewed as a ‘living document’ so that it can be updated and strengthened as new information becomes available.

The report included in this issue of the Journal by Nick Wilson et al (Estimating the impact of the next influenza pandemic on population health and health sector capacity in New Zealand. URL: http://www.nzma.org.nz/journal/118-1211/1346) addresses the impact of another pandemic on New Zealand. Assessing the burden of influenza on hospital admissions and mortality is difficult, as influenza diagnoses are generally not laboratory confirmed and are often attributed to pneumonia or other complications that occur following influenza infection.

The application of statistical modelling can provide a range of estimates of potential impacts in terms of deaths, hospitalisations, and outpatient visits due to pandemic influenza. Modelling helps to structure the discussion on pandemic preparedness and facilitates the translation of pandemic planning concepts to concrete plans.
Unfortunately nobody can predict when the next pandemic will occur, nor can they accurately forecast who will become ill and suffer adverse health outcomes such as death and hospitalisation. Nevertheless, the hosting in Viet Nam of the 2nd International Meeting on Avian Influenza Control in Animals (23–25 February 2005), jointly organised by the Food and Agriculture Organization (FAO), the World Organization for Animal Health (OIE), and the World Health Organization (WHO), has provided yet another platform to bring this important public health issue to the world’s attention.

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Screening for chronic hepatitis B infection in New Zealand: unfinished business

Edward Gane

Half of the world’s population has been exposed to the hepatitis B virus (HBV) at birth or in early childhood, and 350 million have subsequently developed chronic HBV infection. Almost 20% will develop active liver disease (chronic hepatitis B or CHB) and will progress to cirrhosis and liver failure, whilst another 5 to 40% will develop hepatocellular carcinoma.

Universal neonatal vaccination programmes, now established throughout the Asia-Pacific region, should prevent childhood infection and eventually eradicate all HBV-related morbidity and mortality. However, vaccination will not benefit those adults already infected—most of whom remain unaware of their HBV status until they present with advanced liver disease or hepatocellular carcinoma (when therapeutic options are limited and the prognosis poor). Outcomes in chronic HBV infection can only be improved by early detection and treatment through screening of high-risk populations.

A national screening programme for hepatitis B was first advocated almost 20 years ago by Sandor Milne and colleagues, and two Government working parties were conducted in 1994 and 1996 to determine the feasibility of such a programme. Concerns were raised that such a national programme would not be practical and indeed would be unethical until a pilot study in a single geographical region had been evaluated. Doubts were raised as to whether early detection would reduce the morbidity and mortality associated with chronic HBV infection.

This was despite mounting evidence of the increased costs, morbidity, and mortality associated with untreated chronic hepatitis B in this country. Chronic HBV infection was responsible for more than two-thirds of liver-related deaths, one-third of adult liver transplants, and more than three-quarters of cases of hepatocellular carcinoma.

Additionally, a national screening programme appeared to meet all internationally accepted criteria for screening.

- An at-risk population had already been identified to be targeted by screening—endemic rates of chronic HBV infection have been reported in Asian, Maori, and Pacific New Zealanders, who together make up one-third of the total New Zealand population.
- The screening test for chronic HBV infection (serum HBsAg) is inexpensive ($12), safe, and reliable.
- HBsAg screening permits diagnosis and treatment at an early, asymptomatic stage of chronic HBV infection.
Recall procedures are straightforward: all HBsAg-positive individuals are offered life-long surveillance for the two life-threatening complications of chronic HBV—‘chronic hepatitis B’ (CHB) and ‘hepatocellular carcinoma’ (HCC).

Effective treatments are now readily available for both CHB and HCC. Lamivudine is a safe and effective treatment for CHB and has been funded by Pharmac since 2000. In addition to halting progression to cirrhosis and liver failure, long-term lamivudine therapy may actually reverse liver fibrosis.

HCC surveillance was considered controversial until recent case-controlled and randomised-controlled studies demonstrated that 6 monthly surveillance with serum alpha fetoprotein (AFP) measurements, combined with surgical resection, significantly improved survival in populations with endemic HBV infection. This benefit was increased further if newer imaging modalities and liver transplantation were available.

The cost-effectiveness of HCC screening was comparable to other accepted health interventions such as screening for breast cancer or colorectal cancer. In populations where effective treatment modalities are available, future randomised studies of HCC surveillance vs no surveillance would be unethical.

In 1998, the Government decided to fund a national HBV screening programme, targeting Asian, Pacific, and Maori New Zealanders older than 15 years (thus unlikely to be protected by universal neonatal vaccination). Screening commenced in 1999 and continued for 3 years. In this issue of the Journal, Robinson and colleagues report the preliminary results from this programme. Observed rates in Maori (5.6%) were similar to those reported by previous studies, but significantly higher rates were found in Pacific Islanders (median 7.3%, Tongan 13%) and Asians (median 6.2%, 8.1% in South East Asian, 8.9% in Chinese), thus reflecting higher prevalence rates in those countries of birth.

The screening providers should be congratulated for what they have managed to achieve within a relatively short period. This programme represents one of the largest HBV population screening programmes to date. Considerable planning, consultation and innovation overcame the numerous obstacles faced during this project. The contract was awarded to two very different providers—a community-based foundation for the southern region, and a consortium of public health physicians and primary care providers for the northern region. Each provider utilised a screening strategy designed to optimise recruitment for a distinct geographic and demographic target population. Whilst the Northern provider used primary health providers to screen an urbanised population of almost equal numbers of Maori, Pacific, and Asian New Zealanders, the Hepatitis Foundation used community workers to screen predominantly rural Maori.

Development of shared algorithms for screening and follow-up, shared information systems, shared central data repository (NZHIS), and appointment of central steering committee ensured close collaboration, complete data collection, and has facilitated the recent merger of the two regional programmes under the one provider (the Hepatitis Foundation) for continued follow-up of all identified carriers.

The most disappointing aspect of this programme was the poor recruitment. The initial aim was to screen 70% of the target population (initially estimated to be around
500,000). Despite intensive public awareness campaigns prior to commencement of screening, recruitment was extremely difficult, especially in young Maori. This may reflect not only an increasingly mobile target population but also poor public perception of mass screening, possibly linked to negative publicity surrounding previous population screening programmes.

In contrast, more than 45% of the targeted Tongan population were recruited, largely through the hard work of Tongan health providers in Auckland and Wellington. Recruitment rates did improve for all groups in the latter phase of screening, suggesting that extension beyond 3 years may have significantly bolstered recruitment numbers.

Recent population projections estimate that the total number of Maori, Asian, and Pacific Islanders over the age of 15 years and living in New Zealand has now grown to 915,000. Extrapolation from prevalence rates from the current programme would mean that this targeted population would include almost 56,000 carriers. The observed HBsAg prevalence in the non-targeted (predominately European) population was surprisingly high (2.8%), presumably due to over-referral from close contacts of identified carriers. A more conservative figure of 0.42% was reported in an anonymous Police and Customs survey, which would extrapolate to an additional 10,300 carriers in the New Zealand European population.

Therefore, of the estimated 67,000 New Zealanders with chronic HBV infection, only 10,176 (15%) have been identified through the New Zealand HBV screening programme. This discrepancy between screened and unscreened carriers is emphasised by a recent audit of more than 250 HBV-related HCC referred to a tertiary Liver Unit—more than 80% of cases were diagnosed following the onset of symptoms in patients unaware of their HBV status.

Another disturbing observation was that 3.5% of screened individuals under the age of 15 years had chronic HBV infection. This age group was excluded from the targeted population on the assumption that all individuals born in New Zealand after 1997 would be protected by the universal neonatal HBV vaccination programme (introduced that year). The current recombinant vaccine achieves protective immunity in more than 99% neonates, which would imply that most of HbsAg-positive children were never vaccinated. Further analysis is needed to determine what factors were responsible—either country of birth elsewhere in Asia-Pacific region (before the introduction of neonatal vaccination), or failure to receive neonatal vaccination within New Zealand.

Although in its early days, the recruitment of identified HBsAg carriers into the follow-up phase has been excellent. Thorough analysis of secondary care outcome data will be needed to determine the overall benefits of HBV screening. However, preliminary data on HCC surveillance are very encouraging. Already, 60 cases of HCC have been detected in the screened population. These screen-detected tumours were usually small and usually curable by either resection or transplantation. Survival was significantly longer in the screened population (median 44 months) than in the non-screened population (median <3 months), even accounting for lead-time bias.

Similar evaluation of the effect of antiviral therapy on progression of CHB in the screened and non-screened populations is awaited. An estimated 10–15% of the identified carriers will benefit from antiviral therapy. Consideration should be given
to ensure adequate resourcing is available for DHB providers of secondary and tertiary care for this programme.

In summary, the New Zealand HBV Screening Programme team should be congratulated for their achievements. The observed high prevalence of chronic HBV infection in Maori, Pacific, Chinese and South East Asian New Zealanders supports targeted screening. Follow-up of identified carriers should reduce liver-related morbidity and mortality in these ethnic groups. In less than 3 years, more than 11,000 HBsAg carriers have been identified and offered long-term follow-up. However, this represents the tip of the iceberg. The vast majority (85%) of HBsAg-positive New Zealanders remain unaware of their status. Urgent consideration should be given to reopening the screening programme.

Valuable lessons learned to date (such as complementary roles of community and primary care screening strategies) and the strong support gained from primary care, Maori, Pacific, and Asian health providers should guarantee success with future HBV screening.

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COX-2 inhibitors—first, do no harm

Mark Weatherall, Sarah Aldington, Philippa Shirtcliffe, Brent Caldwell, Richard Beasley

On 22 February 2005, Medsafe advised that the increased cardiovascular risk of cyclooxygenase-2 (COX-2) inhibitors outweighs their benefit for the general population and recommended that people at high risk of cardiovascular events should see their doctor to stop treatment with COX-2 inhibitors immediately. This recommendation followed a review of available research data for all currently marketed COX-2 inhibitors. In response to the Medsafe advice, there was widespread public criticism from representatives of the pharmaceutical industry and medical profession.

The main criticisms appeared to be that the finding of an increased cardiovascular risk with the use of COX-2 inhibitors was somehow unexpected; that it was specific to rofecoxib (Vioxx) and was not a class effect; that the magnitude of the risk was very small; that there had been a comprehensive research programme that had demonstrated their safety; and that the New Zealand regulatory authority was ‘out of step’ with the rest of the world.

We briefly examine the evidence relating to each of these issues:

**Plausible biological mechanism**

There is a widely accepted biologically plausible mechanism whereby COX-2 inhibitors would increase the cardiovascular risk through shifting the functional balance of the vaso-active prostanoids towards the promotion of thrombosis and atherogenesis. Thromboxane A₂, a major COX-1 mediated product causes platelet aggregation, vasoconstriction, and smooth muscle proliferation. In contrast, prostacyclin is a major COX-2 mediated product which essentially has the opposite effects of thromboxane A₂, inhibiting platelet aggregation and having antiproliferative and vasodilatory actions.

As a result, by suppressing production of prostacyclin without affecting the synthesis of thromboxane A₂, COX-2 inhibitors have the potential to increase the risk of cardiovascular thromboembolic events.

**Increased cardiovascular risk is a class effect of COX-2 inhibitors.**

Increased cardiovascular risk has now been demonstrated for rofecoxib, celecoxib, valdecoxib, and its pro-drug parecoxib, with insufficient data available concerning etoricoxib, lumiracoxib, and meloxicam. The magnitude and nature of the risks associated with COX-2 inhibitors are illustrated by the three studies published in the *New England Journal of Medicine* on 21 February, a day prior to the Medsafe recommendations.

The ‘Colorectal Adenoma Chemoprevention Trial’ reported a 1.9-fold increased risk of major cardiovascular thrombotic event with rofecoxib when compared with
placebo,\textsuperscript{10} similar to the 2.2-fold risk identified in the previous cumulative meta-analysis of 18 randomised controlled trials of rofecoxib.\textsuperscript{5} A similar magnitude of risk was identified from the comparable Colorectal Adenoma Prevention Trial with celecoxib in which a 2.3- and 3.4-fold increased risk of cardiovascular events was observed with 400 and 800 mg daily doses of celecoxib respectively.\textsuperscript{7}

In the third placebo-controlled study investigating the use of valdecoxib and its pro-drug parecoxib after cardiac surgery, a 3.7-fold increased risk of major cardiovascular events was observed.\textsuperscript{9} As illustrated by these studies, the currently available evidence indicates a class effect of COX-2 inhibitors consistent with the biological mechanism discussed above.

**The magnitude of the cardiovascular risk with COX-2 inhibitors is considerable**

Most of the large clinical trials of COX-2 inhibitors have excluded patients at high risk of cardiovascular events, despite the fact that a sizeable proportion of patients taking these drugs are at significant cardiovascular risk. For example, in the VIGOR Study, patients were excluded if they had received treatment with aspirin or if they had a history of myocardial infarction or coronary bypass in the year before the study.\textsuperscript{6} These criteria led to an incidence of myocardial infarction in the control group of 0.1 per 100 patient years, compared with 0.4 with rofecoxib.

However if the four-fold relative risk of myocardial infarction associated with rofecoxib is applied to a patient at ‘mild to moderate’ baseline cardiovascular risk (1-2\% per year), then one could estimate that the patient would move into the ‘very high’ cardiovascular risk group (4-8\% per year) if taking rofecoxib.\textsuperscript{11} This calculation is based on the finding that the magnitude of the relative risk of myocardial infarction with COX-2 inhibitors is similar for patients of different baseline risk.\textsuperscript{7}

As a result, the absolute risk is substantial in the elderly population in whom this class of drugs is most commonly prescribed. Indeed the United States’ Food and Drug Agency (FDA) itself has estimated that between 88,000 and 140,000 excess cases of serious coronary heart disease might have resulted from rofecoxib rather than other non-steroidal anti-inflammatory drugs (NSAIDs) in the United States alone.\textsuperscript{12}

**Inadequate research programme of cardiovascular risk.**

Clinical trials of COX-2 inhibitors have generally been short-term studies designed to assess their efficacy and to evaluate adverse gastrointestinal effects. Most studies were neither designed nor powered to assess the risk of cardiovascular effects and excluded patients at high risk of cardiovascular events.\textsuperscript{5,13,14}

The use of NSAIDs (rather than placebo) as control medication in many of the studies also made the findings difficult to interpret. As a result, one can draw the conclusion that there has been inadequate research into the cardiovascular effects of COX-2 inhibitors; in particular, there has been a paucity of long-term studies in high-risk populations.
Medsafe recommendations similar to those from other regulatory authorities

The strong warning issued by Medsafe was similar to that made by other regulatory authorities. For example, the European Medicines Agency has also stated that there was an increased risk cardiovascular adverse events for COX-2 inhibitors as a class, and that these medicines should not be used in patients with a history of ischaemic heart disease or stroke.15

To conclude, we refer to the recent New England Journal of Medicine editorial which suggested that due to well-established options for treatment of all approved indications for COX-2 inhibitor drugs, it is reasonable to ask whether the use of these drugs can now be justified.16 The editorial went on to comment that ‘as we apply new science to develop new medicines we must not forget that our first job is to do no harm.’

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Estimating the impact of the next influenza pandemic on population health and health sector capacity in New Zealand

Nick Wilson, Osman Mansoor, Michael Baker

Abstract

**Aim** To estimate the impact of the next influenza pandemic on population health and health sector capacity in New Zealand.

**Method** Population data for New Zealand was used with the software package ‘FluAid’ (CDC, Atlanta). Additional data was used to provide estimates of impacts on health sector capacity.

**Results** For incidence rates in the 15% to 35% range for the first pandemic wave, the modelling results give a range of 1600 to 3700 deaths attributable to pandemic influenza. The estimated range of hospitalisations was between 6900 and 16,200. The estimated number of cases of illness requiring medical consultation ranged from 325,000 to 759,000. For the peak week of an 8-week epidemic (35% incidence scenario), it was estimated that 42% of all public hospital beds would be required at least for some proportion of the week and that the average general practitioner would be consulted by around 80 people with influenza.

**Conclusion** This modelling work has a number of limitations and so these results could still substantially over- or under-estimate the impact of the next influenza pandemic. Nevertheless, the potentially severe impact of pandemic influenza on population health and health sector capacity provides a strong case for health authorities to intensify preparatory efforts and to strengthen health sector infrastructure.

There have been 31 influenza pandemics reported since the first pandemic described in 1580 and the major influenza pandemics of the 20th century (1918, 1957, and 1968) all reached New Zealand. Furthermore, New Zealand was unable to avoid any of the three pandemic waves that comprised the 1918 pandemic. In this pandemic, between a third to a half of the entire population suffered illness and there were an estimated 8250 deaths (0.74% of the population). Its impact on Maori was particularly severe.

Another influenza pandemic is considered to be highly likely or even inevitable. In 1997 and 2003, new strains of influenza virus emerged that had the potential to become pandemic, though their circulation may have been stopped by the mass slaughter of poultry. There is also concern that influenza could be genetically modified and used as a bioweapon.

New Zealand has undertaken influenza pandemic planning and undertaken simulation exercises. The pandemic plan has even been updated in the light of the experience with SARS. However, there has been relatively little work to estimate the likely impact of pandemic influenza on population health. Therefore this article aims to provide estimates for the impact of pandemic influenza on health and the New Zealand health sector.
Zealand health sector through the use of a publicly available software package and model (FluAid).

Methods

Modelling assumptions and software—The US Centers for Disease Control and Prevention (CDC) developed software package, FluAid\textsuperscript{14} utilises a relatively simple deterministic model. The output of the model is the number of deaths, hospitalisations, and illness requiring medical consultations for a single wave of pandemic influenza. The model assumes no effective public health interventions to control disease spread (such as use of an appropriate vaccine or widespread use of antiviral drugs). Specific details on the FluAid software and the various assumptions in the model are detailed on the CDC website\textsuperscript{15,16} and other documents.\textsuperscript{16,17}

Given the lack of relevant New Zealand data, the default values used in FluAid were used for the proportion of the population in the ‘high-risk’ category for each age group, the mortality rates, the hospitalisation rates, and the rates of illness. The model’s parameters were based on the available data (mostly from North America and some from Europe) from the 1957 pandemic and subsequent non-pandemic data.\textsuperscript{16} Individuals categorised as “high-risk” are those who have a pre-existing medical condition (e.g. diabetes) that makes them more susceptible to developing medical complications due to influenza. The proportions in the “high-risk” category used in the model were 6.4% for 0-18-year-olds, 14.4% for 19–64-year-olds, and 40% for those aged 65 years and older. The output values from the model were for ‘most likely,’ ‘minimum,’ and ‘maximum’ values (each for mortality, hospitalisation, and illness requiring medical consultations).

Population data sources—The population data used for national level calculations were Statistics New Zealand population estimates for 2004.\textsuperscript{18} District health board (DHB) level calculations used 2001 Census data.\textsuperscript{19}

Time distribution—The FluAid model does not consider the time frame of the epidemic within an affected region. The length of influenza epidemics is highly variable\textsuperscript{20,21} but for this analysis the first pandemic wave was assumed to span 8 weeks with a distribution pattern in which 80% of cases occurred in a 3-week period around the peak of the epidemic (as per the pattern for the deaths in the second pandemic wave of the 1918 pandemic for Auckland, Wellington, Christchurch, and Dunedin\textsuperscript{3}). This distribution is very similar to that of a recently published stochastically simulated influenza epidemic\textsuperscript{22} (i.e. both models had 32% of the clinical cases occurring in the ‘peak week’ of the pandemic wave).

Health sector capacity data—Data outputs from the model were used to estimate the demand on the health sector. The supply side was based on the most up-to-date data on: total number of public hospital beds in the country (12,484 in 2002), non-pandemic year mortality levels (28,224 deaths for the most recent year i.e., 1999 – giving a weekly average of 543 deaths per week), total number of general practitioners (2917 in 2002) and total number of registered nurses working in primary healthcare (3394 in 2003).\textsuperscript{23}

Results

Mortality—The model predicts 1600 to 3700 deaths as most likely from the first wave of pandemic influenza that has incidence rates of 15% and 35%, respectively (Table 1). Most (83%) of these deaths, would be among those with high-risk conditions (with 42% aged 19-64 years and 41% aged 65 years and over).

Hospitalisations—The model predicts likely hospitalisations at between 6900 and 16,200 with a full range of 2500 to 20,800 (Table 2). Of these hospitalisations, 71% would be of people without high-risk conditions (55% would be aged 19–64 years and 12% would be 65+). Only 10% and 19% of hospitalisations would be contributed by those with high-risk conditions in the 19–64 and 65+ age groups respectively.

Illness requiring medical consultations—The model predicts 325,000 to 759,000 medical consultations with a full range of 254,000 to 1.1 million (Table 3). Of these
consultations, most (85%) would be among those without high-risk conditions (28% aged 0-18 years, 50% aged 19-64 years, and 7% aged 65+ years).

Table 1. Predicted number of deaths nationally in a future New Zealand influenza pandemic (based on modelling with FluAid)

<table>
<thead>
<tr>
<th>Age groups</th>
<th></th>
<th>Gross incidence rates*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15%</td>
<td>25%</td>
</tr>
<tr>
<td>0–18 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most likely</td>
<td>18</td>
<td>29</td>
</tr>
<tr>
<td>Minimum</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>Maximum</td>
<td>243</td>
<td>405</td>
</tr>
<tr>
<td>19–64 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most likely</td>
<td>762</td>
<td>1270</td>
</tr>
<tr>
<td>Minimum</td>
<td>109</td>
<td>182</td>
</tr>
<tr>
<td>Maximum</td>
<td>1431</td>
<td>2385</td>
</tr>
<tr>
<td>65+ years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most likely</td>
<td>796</td>
<td>1327</td>
</tr>
<tr>
<td>Minimum</td>
<td>772</td>
<td>1287</td>
</tr>
<tr>
<td>Maximum</td>
<td>987</td>
<td>1646</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most likely</td>
<td>1576</td>
<td>2626</td>
</tr>
<tr>
<td>Minimum</td>
<td>891</td>
<td>1486</td>
</tr>
<tr>
<td>Maximum</td>
<td>2661</td>
<td>4436</td>
</tr>
</tbody>
</table>

*These incidence rates are for clinical illness of a severity that causes some measurable economic impact, such as one-half day of work lost, or a visit to a doctor.

Table 2. Predicted number of hospitalisations nationally in a future New Zealand influenza pandemic (based on modelling with FluAid)

<table>
<thead>
<tr>
<th>Age groups</th>
<th></th>
<th>Gross incidence rates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15%</td>
<td>25%</td>
</tr>
<tr>
<td>0–18 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most likely</td>
<td>314</td>
<td>524</td>
</tr>
<tr>
<td>Minimum</td>
<td>155</td>
<td>258</td>
</tr>
<tr>
<td>Maximum</td>
<td>1318</td>
<td>2197</td>
</tr>
<tr>
<td>19–64 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most likely</td>
<td>4502</td>
<td>7504</td>
</tr>
<tr>
<td>Minimum</td>
<td>833</td>
<td>1388</td>
</tr>
<tr>
<td>Maximum</td>
<td>4915</td>
<td>8192</td>
</tr>
<tr>
<td>65+ years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most likely</td>
<td>2123</td>
<td>3538</td>
</tr>
<tr>
<td>Minimum</td>
<td>1517</td>
<td>2529</td>
</tr>
<tr>
<td>Maximum</td>
<td>2683</td>
<td>4472</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most likely</td>
<td>6939</td>
<td>11,566</td>
</tr>
<tr>
<td>Minimum</td>
<td>2505</td>
<td>4175</td>
</tr>
<tr>
<td>Maximum</td>
<td>8916</td>
<td>14,861</td>
</tr>
</tbody>
</table>

Health sector capacity—In the peak week of the epidemic, it is estimated that influenza deaths would exceed the usual (non-pandemic year) weekly average by 2.2 times (35% incidence scenario) (Table 4). Also, in this peak week, it is estimated that 42% of all public hospital beds would be required for pandemic influenza cases, at least for some proportion of the week. If the average length of hospital stay is half a week per influenza case, then only half this proportion of all beds would be required for influenza cases (i.e. 21% of beds in the peak week of the epidemic).
Table 3. Predicted number of medical consultations* nationally in a future New Zealand influenza pandemic (based on modelling with FluAid)

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Gross incidence rates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15%</td>
</tr>
<tr>
<td>0–18 years</td>
<td>Most likely</td>
</tr>
<tr>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td></td>
<td>Maximum</td>
</tr>
<tr>
<td>19–64 years</td>
<td>Most likely</td>
</tr>
<tr>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td></td>
<td>Maximum</td>
</tr>
<tr>
<td>65+ years</td>
<td>Most likely</td>
</tr>
<tr>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td></td>
<td>Maximum</td>
</tr>
<tr>
<td>Total</td>
<td>Most likely</td>
</tr>
<tr>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td></td>
<td>Maximum</td>
</tr>
</tbody>
</table>

* In the FluAid model this category was described as “outpatient-based visits”, but in the New Zealand context this would generally equate to primary care consultations ie, with general practitioners.

Table 4. Predicted time distribution of the health impact and demand on services from influenza (assuming a 35% incidence rate—‘most likely’ estimates) in a future New Zealand influenza pandemic (based on modelling with FluAid)

<table>
<thead>
<tr>
<th>Week (% of cases)</th>
<th>Deaths (No.)</th>
<th>Deaths as a % of the normal weekly average</th>
<th>Hospitalisations (No.)</th>
<th>Proportion of public hospital beds required</th>
<th>Medical consultations (No.)</th>
<th>Cnsns per GP per week*</th>
<th>Cnsns per registered nurse working in primary healthcare per week**</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (1%)</td>
<td>37</td>
<td>7%</td>
<td>162</td>
<td>1%</td>
<td>7587</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>2 (5%)</td>
<td>184</td>
<td>34%</td>
<td>810</td>
<td>6%</td>
<td>37,934</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>3 (24%)</td>
<td>882</td>
<td>163%</td>
<td>3886</td>
<td>31%</td>
<td>182,085</td>
<td>62</td>
<td>27</td>
</tr>
<tr>
<td>4 (32%)</td>
<td>1177</td>
<td>217%</td>
<td>5181</td>
<td>42%</td>
<td>242,780</td>
<td>83</td>
<td>36</td>
</tr>
<tr>
<td>5 (24%)</td>
<td>882</td>
<td>163%</td>
<td>3886</td>
<td>31%</td>
<td>182,085</td>
<td>62</td>
<td>27</td>
</tr>
<tr>
<td>6 (8%)</td>
<td>294</td>
<td>54%</td>
<td>1295</td>
<td>10%</td>
<td>60,695</td>
<td>21</td>
<td>9</td>
</tr>
<tr>
<td>7 (4%)</td>
<td>147</td>
<td>27%</td>
<td>648</td>
<td>5%</td>
<td>30,347</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>8 (2%)</td>
<td>74</td>
<td>14%</td>
<td>324</td>
<td>3%</td>
<td>15,174</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>3677</td>
<td>Average=85%</td>
<td>16,191</td>
<td>Average=16%</td>
<td>758,687</td>
<td>Average=33</td>
<td>Average=14</td>
</tr>
</tbody>
</table>

Cnsns=Consultations; GPs=General Practitioners; *Assuming that 100% of medical consultations are seen by general practitioners; **Assuming that 50% of medical consultations are seen by these nurses (with the rest seen by GPs).

It is estimated that 83 influenza consultations per general practitioner (GP) would occur during the peak week. But if only 50% to 75% of GPs were working during this week (e.g. due to illness or caring for relatives), then the average weekly caseload would rise to 125 to 166 people. If half of the consultations for influenza were seen by a registered nurse working in primary healthcare, then during the peak week these nurses would be consulted by 36 people per week. But if only 50% to 75% of such nurses were working during this week, then the average weekly caseload would rise to 54 to 72 people.
**DHB impact**—The impact at the DHB level is entirely related to the age structure and size of the population (since the FluAid model does not address differences in rural versus urban risk of infection). The impact in terms of numbers would be highest in Canterbury for deaths and hospitalisations (413 and 1776 respectively) and in Waitemata for consultations (80,706) (Table 5).

**Table 5. Predicted health impact at the district health board (DHB) level (assuming a 35% incidence rate—‘most likely’ estimates and based on 2001 Census data) in a future New Zealand influenza pandemic (based on modelling with FluAid)**

<table>
<thead>
<tr>
<th>District Health Board</th>
<th>Deaths (No.)</th>
<th>Hospitalisations (No.)</th>
<th>Consultations (No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northland</td>
<td>132</td>
<td>559</td>
<td>26,396</td>
</tr>
<tr>
<td>Waitemata</td>
<td>372</td>
<td>1681</td>
<td>80,706</td>
</tr>
<tr>
<td>Auckland</td>
<td>321</td>
<td>1471</td>
<td>68,740</td>
</tr>
<tr>
<td>Counties Manukau</td>
<td>290</td>
<td>1361</td>
<td>70,964</td>
</tr>
<tr>
<td>Waikato</td>
<td>282</td>
<td>1241</td>
<td>59,843</td>
</tr>
<tr>
<td>Lakes</td>
<td>83</td>
<td>368</td>
<td>18,096</td>
</tr>
<tr>
<td>Bay of Plenty</td>
<td>177</td>
<td>736</td>
<td>33,504</td>
</tr>
<tr>
<td>Tairawhiti</td>
<td>39</td>
<td>167</td>
<td>8318</td>
</tr>
<tr>
<td>Taranaki</td>
<td>100</td>
<td>420</td>
<td>19,377</td>
</tr>
<tr>
<td>Hawke’s Bay</td>
<td>135</td>
<td>576</td>
<td>27,019</td>
</tr>
<tr>
<td>Whanganui</td>
<td>62</td>
<td>259</td>
<td>11,973</td>
</tr>
<tr>
<td>Midcentral</td>
<td>147</td>
<td>628</td>
<td>29,125</td>
</tr>
<tr>
<td>Hutt</td>
<td>113</td>
<td>511</td>
<td>24,799</td>
</tr>
<tr>
<td>Capital and Coast</td>
<td>213</td>
<td>975</td>
<td>46,024</td>
</tr>
<tr>
<td>Wairarapa</td>
<td>38</td>
<td>159</td>
<td>7175</td>
</tr>
<tr>
<td>Nelson Marlborough</td>
<td>121</td>
<td>511</td>
<td>22,950</td>
</tr>
<tr>
<td>West Coast</td>
<td>29</td>
<td>125</td>
<td>5679</td>
</tr>
<tr>
<td>Canterbury</td>
<td>413</td>
<td>1776</td>
<td>79,923</td>
</tr>
<tr>
<td>South Canterbury</td>
<td>58</td>
<td>231</td>
<td>9881</td>
</tr>
<tr>
<td>Otago</td>
<td>170</td>
<td>719</td>
<td>31,963</td>
</tr>
<tr>
<td>Southland</td>
<td>95</td>
<td>418</td>
<td>19,391</td>
</tr>
</tbody>
</table>

**Discussion**

**Mortality impact**—The modelling results suggest a potentially large death toll from the next influenza pandemic in the range of 1600 to 3700 deaths. This outcome would make it the worst internal demographic event for New Zealand since the 1918 pandemic. The upper figure in this range gives a mortality rate of 91 per 100,000 (albeit for a single wave), which compares to 745 per 100,000 in New Zealand from the 1918 pandemic (i.e. a time when antibiotics were not available and medical care was much less advanced). It is also less than the 1918 pandemic mortality rate for the United States of 218 per 100,000; but more than United States rates for the 1957 Asian flu pandemic (22 per 100,000) and the 1968 Hong Kong flu pandemic (14 per 100,000).

Although very high, this death toll would still be less than the Ministry of Health’s estimates for annual deaths attributable to diet (around 8500 deaths), tobacco (5000), deprivation (4800), and cholesterol (4700). Even so, pandemic influenza may cause
a disproportionately high number of years of life lost due to the relatively high proportion of deaths in the 19–64 year old age group (compared to these other causes where the premature deaths are generally in older age groups). Furthermore, these deaths would be concentrated over a short period (assumed to be 8 weeks in this modelling).

The high concentration of deaths among those with high-risk conditions in the over 18-year age group (83% of the total) would suggest the importance of targeting available preventive measures (in terms of anti-virals and appropriate vaccinations, when these become available). But in fact some particular strains of pandemic influenza (such as the 1918 strain) may still have a severe impact on mortality among healthy young people (an issue not adequately addressed by this particular model).

**Hospitalisations**—The ‘most likely’ range of hospitalisations attributable to pandemic influenza was between 6900 and 16,200 (Table 2). It is likely that these levels would overwhelm current hospital capacity for much of the epidemic time period (especially for the 35% incidence scenario). Indeed, some New Zealand hospitals already suffer from capacity problems during winter months of non-pandemic influenza years. Rapid action at the start of the epidemic could free up hospital beds and resources (e.g. cancelling of elective procedures and early discharge to community care).

Other contingency planning by DHBs and hospitals could also facilitate lower hospital admission rates (e.g. through strengthening primary care response capacity both now and during the crisis phase). The use of stockpiled antiviral medication for these health workers would help to reduce worker absenteeism rates as might plans to care for the ill dependents of health staff to reduce absenteeism.

Other work on influenza pandemic reaching New Zealand suggests that the demands for critical care beds and for mechanical ventilation may also exceed current capacity under some pandemic scenarios. Planning can identify additional beds that could be utilised when critical care services reach capacity. However, whatever planning is put in place it is likely that some difficult decisions will be required in limiting hospital care to those where it would most likely affect final health outcomes.

A potential upstream approach to limiting the burden of hospitalisations and deaths includes reducing the prevalence of chronic diseases known to increase the risk of adverse sequelae of influenza infection. This would suggest a stronger focus by the health sector on promoting tobacco control, improving nutrition and increasing physical activity levels.

**Illness requiring consultations**—The estimated number of medical consultations attributable to pandemic influenza was huge, with an upper limit of 1.1 million consultations. During the peak of the epidemic, the numbers could strain the resources of GPs and primary care nurses in some areas (e.g. for the 35% incidence scenario). This workload would be particularly acute in those parts of the country that are relatively under-served by GPs (e.g. the West Coast). The workload problem could potentially be reduced through public education on appropriate home care for those with influenza and by providing information on when to seek medical attention (e.g. as detailed on a CDC website). Indeed, this approach could be promoted now so that the public build up further knowledge and experience about when medical consultation is really required for influenza-like illness. Similarly, public education...
could encourage the use of the existing free telephone ‘Healthline’ service (that provides access to a registered nurse) so that the need for face-to-face consultations with GPs and nurses is reduced. Contingency planning could also address the issues of recalling GPs and nurses back from leave or retirement, and even utilising medical students (as done in 1918 in New Zealand\textsuperscript{29}). The co-ordinated efforts of volunteers were also very valuable for providing home care during 1918 in New Zealand\textsuperscript{3,30} If employers relaxed requirements for medical certificates associated with influenza-like illness then this might also reduce the demand for these more “administrative” type of medical consultations.

**Limitations with the modelling**—The uncertainties associated with pandemic influenza mean that any modelling of its future impact is relatively crude. Modelling using the FluAid model also has a number of specific limitations (e.g. it is entirely deterministic and does not include any stochastic elements). Results from this model could be substantial underestimates of the health impact of the next pandemic for the following reasons:

- The new strain may be particularly infectious and/or virulent as a result of evolutionary processes or genetic engineering as part of bioweapon development. Indeed, the model conservatively used an upper incidence rate for clinical illness of 35% when higher rates (e.g. 50%) are quite plausible given the experience of past pandemics such as the 1918 one.

- The proportions of the population in various high-risk groups in New Zealand might be larger than used in the model (e.g. given the overall aging of the population and some evidence for the increasing prevalence of diabetes in New Zealand).

- The mortality rate may be higher if the level of antibiotic resistance (e.g. of *Streptococcus pneumoniae*) continues to increase and alternative treatments for the secondary bacterial infections following influenza infection are not available.

In contrast, the results could be overestimates of the health impact of the next pandemic for the following reasons:

- The use of international level public health interventions as recommended by WHO\textsuperscript{31} may prevent or at least delay pandemic influenza reaching New Zealand. These include the provision of health alert notices to incoming travellers and even the use of entry screening (for ‘geographically isolated infection-free areas’). Improvements in surveillance systems (combined with access to rapid detection kits) over time may also increase the chances of control measures being successful.

- If New Zealand avoided the first pandemic wave it may have access to a vaccine for protection from subsequent pandemic waves (though this may take 6–9 months from the time that a new virus variant is first identified\textsuperscript{32}).

- The use of antivirals\textsuperscript{33} could prevent infection and reduce morbidity among key personnel and also those with high-risk conditions—but only if supplies are adequate. A recent study suggests that pandemic influenza could be contained with ‘the use of antiviral prophylaxis, if 80% of the exposed persons maintained prophylaxis for up to 8 weeks.’\textsuperscript{22}
• Improved treatment in the community and hospital could lower hospitalisation and mortality rates (relative to those used in this model).

Another limitation with this modelling is that it does not consider any differential risks for adverse outcomes among particular population groups such as Maori and Pacific Peoples. Even in non-pandemic years Maori and Pacific Peoples have relatively higher rates of hospitalisations and deaths for respiratory infections (primarily pneumonia/influenza). This difference may be due to higher prevalence rates of high-risk conditions (e.g. diabetes and chronic lung disease) but other factors might also be relevant (e.g. higher levels of disease transmission in situations of over-crowded housing). Similarly, the model does not consider rurality—despite past evidence for pandemic influenza having less impact in rural settings.

**Further research**—This modelling could be further refined to address some of the limitations detailed above. Nevertheless, such refinements are unlikely to address some of the fundamental uncertainties around the basic biological characteristics of a new emergent strain of natural or engineered pandemic influenza. Further work could also be done to access the impact of pandemic influenza on the economy and society (e.g. as done in the US). Such impacts could in turn have indirect affects on health outcomes. For example, a major downturn in tourism associated with a pandemic could impact on health via increased unemployment rates and poverty levels.

**Summary**—This modelling work has a number of limitations and so these results could still substantially over- or under-estimate the impact of the next influenza pandemic. Nevertheless, the potentially severe impact of pandemic influenza on population health and health sector capacity provides a strong case for health authorities to intensify preparatory efforts and to strengthen health sector infrastructure.

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**References:**


The New Zealand Hepatitis B Screening Programme: screening coverage and prevalence of chronic hepatitis B infection

Tom Robinson, Chris Bullen, Wendy Humphries, John Hornell, Chris Moyes

Abstract

Aim To report on screening coverage and the distribution of HBsAg (a marker of chronic hepatitis B virus infection) among participants in the New Zealand Hepatitis B Screening Programme.

Method Coverage and crude and age-standardised prevalence rates of HBsAg by age group, sex, ethnic group, and region were calculated from data held by the two providers and the New Zealand 2001 Census.

Results 177,000 people were tested for hepatitis B virus infection (51% of the programme targets and 27% of Census 2001 eligible population), with highest coverage among women (28.9%) and Pacific people (34.9%). Overall, 5.7% (10,176) of participants were HBsAg-positive and there were significant regional, ethnic group, and gender differences. 5.6% of Maori, 7.3% of Pacific people, and 6.2% of Asians were HBsAg-positive, and men were more likely to test HBsAg-positive (6.1%) than women (5.4%).

Conclusions Previous estimates of HBsAg prevalence among Maori and Pacific people from smaller surveys were confirmed and new information obtained about the distribution of hepatitis B virus infection among Pacific Islands and Asian populations in New Zealand. Opportunistic screening of adults in these populations should continue in order to identify others with (as yet undetected) infection. Regular follow-up of people with chronic hepatitis B virus infection should also continue. Ongoing outcome monitoring is now needed to judge whether this unique programme has been an effective component of New Zealand’s hepatitis B control strategy and whether it is a worthwhile investment of resources.

An estimated 350 million people worldwide are chronically infected with hepatitis B virus (HBV). While international comparative data suggest that New Zealand falls into the ‘lowest’ prevalence category, numerous studies in New Zealand over the past 30 years have shown that there is considerable variation in the prevalence of chronic hepatitis B virus infection (CHB) for specific regions, towns, ethnic groups, workforce, and age groups.

All studies have shown high rates of hepatitis B exposure and CHB in Maori, with estimates of CHB ranging from 5.4% in Maori police and customs workers in the late 1980s to around 16% in Maori children in the Eastern Bay of Plenty in the early 1980s (prior to the introduction of infant hepatitis B immunisation).

In contrast, rates of CHB among European populations have been no higher than 3% and generally less than 1%. The largest survey, undertaken in the Eastern Bay of Plenty in the mid 1980s, tested 7901 people (some were children). There are limited
data on CHB in Pacific and Asian people in New Zealand, but hepatitis B infection is known to be endemic in the Pacific Islands and most Asian countries. The most reliable data for Pacific people in New Zealand come from an analysis of 1987 police and customs workforce records, indicating a CHB prevalence of 4.4%. CHB was found in 3.9% of ‘others’, presumably including people of Asian ethnic heritage. Variations in prevalence by geographic region have also been noted in several studies, suggesting a north-south gradient, with higher rates in northern New Zealand than in the south. Universal infant hepatitis B vaccination introduced in New Zealand in the late 1980s will ultimately have the greatest impact on the control of hepatitis B and its sequelae. Meanwhile there are an estimated 40,000 people with CHB in New Zealand—most of whom are unaware of their hepatitis B status unless detected on a routine laboratory test or presenting at a late stage with clinical manifestations of chronic liver disease or hepatocellular carcinoma (HCC).

Approximately 10–20% of people with CHB develop cirrhosis. A Maori male with CHB is estimated to have a 10–15% probability of developing hepatocellular carcinoma (HCC) by age 70. The burden of disease caused by HBV infection is unevenly distributed: over 50% of all chronic liver disease mortality among Maori and Pacific people in New Zealand has been shown to be attributable to CHB, compared to only 10% among Europeans.

A risk to the public health also exists, especially to susceptible individuals in high prevalence populations. These include older children and teenagers inadequately immunised as infants, especially many Maori and Pacific children among whom immunisation coverage is sub-optimal.

Screening of people for hepatitis B status has previously been carried out in an *ad hoc* manner. In the 1980s and 1990s the Hepatitis Foundation, a Whakatane-based non-governmental organisation, screened high-risk populations in several areas of the North Island. Antenatal screening has included a test for hepatitis B (HBsAg) since the early 1980s and blood donors have also been screened since this time.

In the early 1990s, the Hepatitis Foundation campaigned energetically for organised hepatitis B screening because of concerns about the impact of CHB in high-risk populations, especially Maori. A working party on hepatitis B was convened by the Ministry of Health in 1994 to consider the evidence for an organised hepatitis B screening programme in New Zealand and concluded that there were insufficient grounds to recommend it’s favour.

Following further lobbying from the Foundation, two international experts reviewed the Working Party findings and recommended that a pilot screening programme be conducted in a defined geographic area. This proposal was developed further by a 1996 Working Party and led to the Ministry of Health proposing a pilot-screening programme for South Auckland and a Northland district. However, in 1998 Cabinet overturned this decision and instead providers were asked to specify what they could deliver for the available funding ‘in areas of the country with the greatest prevalence of infection.’

Contracts were awarded to two separate agencies: the Northern Region Hepatitis Consortium (comprising Auckland District Health Board, Ngati Whatua, and Maori
and Pacific primary care and public health organisations), responsible for screening and follow-up (immunisation, counselling and surveillance) of Maori, Pacific and Asian people aged 15 years and over in the Northland and Auckland regions; and the Hepatitis Foundation, responsible for screening and follow-up in all other regions in the North Island.

Due to its much smaller Maori, Pacific, and Asian populations, the South Island was not included. The 15 to 40 year age-group was a particular focus of the programme as this group was seen to have most to gain from both immunisation if non-immune, and surveillance if HBsAg-positive. The aim was to screen 70% of the eligible population. According to the 1996 Census there were nearly 500,000 people in these groups and the total number of screenings targeted was therefore 345,750. This paper reports on overall coverage and the distribution of HBsAg among participants in the New Zealand Hepatitis B Screening Programme.

Methods

The Hepatitis Foundation employed teams of phlebotomists to work directly with communities using local facilities such as marae, or purpose-built caravans as screening centres. The Foundation began screening in July 1999 and completed screening in June 2002. The Northern Consortium’s strategy was based primarily on supporting general practitioners and Maori and Pacific providers to recruit individuals. Contact with individuals was either opportunistic, by invitation letter or phone call, or resulting from wider community promotion of the service on radio, at meetings in churches or marae. Where appropriate, screening was also undertaken by outreach teams in community venues and events. The Northern Consortium did not begin until April 2000 and completed screening in December 2002.

After receiving informed consent, a blood sample was taken from participants, and the serum was then transported (within defined time and temperature limits) to one of two designated laboratories for testing. All blood samples were tested for HBsAg. Those that were HBsAg-positive were also tested for e antigen (HBeAg) status; alanine aminotransferase (ALT), a marker of active hepatitis; and alpha fetoprotein (AFP), a marker of HCC. People who were HBsAg negative were tested for anti-HBs.

In a small number of cases, individuals who had been previously identified as having CHB were included in the programme by using the results of a recent test. All assays on sera collected from participants were performed in Whakatane at the Hepatitis Foundation Laboratory or at Middlemore Hospital Laboratory using identical analysers and techniques: HBsAg, anti-HBs, and AFP assays were performed on Abbott Architect 2000 analysers using chemiluminescent microparticle immunoassay; HBeAg on Abbott AxSym using Microparticle Enzyme Immunoassay; and ALT on Abbott Aeroset using a colorimetric assay.

Both organisations maintained a SQL/Access database that included demographic details of every participant together with the results of the blood tests and all follow-up received. Regions were defined by aggregating territorial local authorities (based upon communities of interest) rather than using regional authority areas (based upon environmental needs). Ethnicity data were collected from consent forms according to standard Ministry of Health codes with each person self-identifying a single ethnic affiliation that was then aggregated to ‘Maori,’ ‘Pacific,’ ‘Asian,’ and ‘Other’ ethnic groupings.

Data from the 2001 Census for ethnicity, age groups, region, and gender were used for the denominator in coverage calculations. To be comparable with screening data, prioritised ethnic groupings from the census were used. Where coverage rates for more specific ethnic groups are given, such prioritisation is not possible and denominators are therefore slightly inflated. Direct age- and gender-standardised rates were calculated for each ethnic group. Direct age-standardised rates were calculated for Maori in each region but there were insufficient people of other ethnic groups screened in many regions to present age-standardised regional rates for those groups.

The 2001 New Zealand Census population was used in each case as the standard population. Although some children under 15 years were screened (largely as household contacts of people found to have CHB) they were not a primary target group and were less likely to be representative of the general population. Therefore the standardised rates given are for the adult population only. Because the ‘response rate’ was only 27%, sensitivity analyses were undertaken as outlined by Greenland19 around
these prevalence estimates to provide a valid range within which the true population prevalence lies. These are based on the alternative assumptions that people in the target groups who were not recruited were either 50% more likely or 33% less likely to have CHB than those that were recruited.

Results

Screening coverage

Table 1 shows the number of people in the target groups and the number of people screened by the programme. 177,328 people were screened, of which 153,605 (87%) were Maori, Pacific, or Asian adults.

Table 1. Coverage of the Hepatitis B screening programme by age, gender, ethnicity, region, and provider

<table>
<thead>
<tr>
<th>Category</th>
<th>Variable</th>
<th>Target population</th>
<th>Number screened (all participants)</th>
<th>Number screened in target ethnic and age-group populations</th>
<th>Coverage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
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</tr>
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<td>199269</td>
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<td>66937</td>
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<td>86397</td>
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<td>Ethnicity</td>
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<td>81219</td>
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<tr>
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<td>Pacific</td>
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<td>42834</td>
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<td>Asian</td>
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<td>Other</td>
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<td>18838</td>
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<tr>
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<td>-Tongan</td>
<td>22329</td>
<td>10478</td>
<td>10154</td>
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</tr>
<tr>
<td></td>
<td>-Niuean</td>
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<td>1995</td>
<td>1959</td>
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<tr>
<td></td>
<td>-Tokelauan</td>
<td>3417</td>
<td>1080</td>
<td>1047</td>
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<tr>
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<td>-Fijian</td>
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<td>1109</td>
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<td>-Southeast Asian</td>
<td></td>
<td>20091</td>
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<td>-Indian</td>
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<td>7497</td>
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<td>7423</td>
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<td>73763</td>
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<td>16298</td>
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<td>6770</td>
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<td>1082</td>
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<td>8581</td>
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<td>22441</td>
<td>19522</td>
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<td>Provider</td>
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<td>79192</td>
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</tr>
<tr>
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<td>Hepatitis</td>
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<td>87489</td>
<td>74413</td>
<td>29.4</td>
</tr>
<tr>
<td></td>
<td>Foundation</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>565836</td>
<td>177328</td>
<td>153605</td>
<td>27.1</td>
</tr>
</tbody>
</table>

BOP=Bay of Plenty; NRHC=Northern Region Hepatitis Consortium; *Manawatu; na=not applicable.
Using the 2001 census the target population had increased to over 565,000 people (largely due to the growth in New Zealand’s Asian population). Overall coverage among the target group was 27.1%, with higher coverage rates among women and 15-40 year olds than among men and the over 40 age group. The highest coverage achieved was among Pacific people, in particular among the Tongan community from which nearly half participated. Coverage among Asian people was relatively low.

Table 2. HBsAg prevalence by age, sex, ethnicity and region

<table>
<thead>
<tr>
<th>Category</th>
<th>Variable</th>
<th>Sample size</th>
<th>Number of HBsAg-positive participants</th>
<th>HBsAg+ prevalence (%)</th>
<th>95% CI</th>
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</thead>
<tbody>
<tr>
<td>Age</td>
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<td>109</td>
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<td>2.9–4.2</td>
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<td>15-40</td>
<td>118779</td>
<td>6492</td>
<td>5.5</td>
<td>5.3–5.6</td>
</tr>
<tr>
<td></td>
<td>&gt;40</td>
<td>55406</td>
<td>3575</td>
<td>6.5</td>
<td>6.2–6.7</td>
</tr>
<tr>
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<td>5.9–6.3</td>
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<tr>
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<td>5318</td>
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<td>5.3–5.6</td>
</tr>
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<td>Ethnicity</td>
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<td>5.4–5.7</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>-Samoan</td>
<td>19298</td>
<td>867</td>
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<td>4.2–4.7</td>
</tr>
<tr>
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<td>446</td>
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<td>5.7–6.9</td>
</tr>
<tr>
<td></td>
<td>-Tongan</td>
<td>10478</td>
<td>1370</td>
<td>13.1</td>
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</tr>
<tr>
<td></td>
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<td>7.3–9.8</td>
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<td>41</td>
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<td>-Fijian</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-SE Asian</td>
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</tr>
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<td>6.8–7.1</td>
</tr>
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<td>887</td>
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<td>4.4–5.0</td>
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<td>349</td>
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<td>4.1–5.0</td>
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<td>Taranaki</td>
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<td>2.3–4.2</td>
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<td>3.6–4.4</td>
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<tr>
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<td>Man*-Wanganui</td>
<td>5245</td>
<td>221</td>
<td>4.2</td>
<td>3.7–4.8</td>
</tr>
<tr>
<td></td>
<td>Wellington</td>
<td>22441</td>
<td>801</td>
<td>3.6</td>
<td>3.3–3.8</td>
</tr>
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<td>10176</td>
<td>5.7</td>
<td>5.6–5.8</td>
</tr>
</tbody>
</table>

BOP=Bay of Plenty; SE Asian=South-East Asian (e.g. Thai); CI=confidence interval; *Manawatu.

The programme had considerably more success in some regions than in others. In particular, the coverage rates achieved by the Hepatitis Foundation in the eastern part of the North Island were higher than those in the western part.

**HBsAg Prevalence**

5.7% of participants were HBsAg-positive. These rates were significantly higher for older people compared to younger, males compared to females, and for Pacific people compared to Maori and Asians (Table 2). There were significant regional variations
with Auckland having a high overall prevalence and Waikato, Taranaki, and Wellington having a low prevalence. Within the ethnic groupings there was considerable variation, from a low of 0.6% in Indians to 13% in Tongans.

Analysis by sex and ethnic group showed that Pacific people had a higher age-standardised prevalence than Maori or Asians, and that males in all ethnic groups also had significantly higher HBsAg prevalence than females (Table 3).

Table 3. Adult age-standardised HBsAg prevalence by sex and ethnic group

<table>
<thead>
<tr>
<th>Gender</th>
<th>Ethnicity</th>
<th>HBsAg prevalence (%)</th>
<th>95% CI (%)</th>
<th>Sensitivity analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>Maori</td>
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<td>3.9–4.4</td>
<td>3.1–5.6</td>
</tr>
<tr>
<td></td>
<td>Pacific</td>
<td>6.2</td>
<td>5.8–6.6</td>
<td>4.9–8.2</td>
</tr>
<tr>
<td></td>
<td>Asian</td>
<td>5.2</td>
<td>4.8–5.6</td>
<td>3.8–7.3</td>
</tr>
<tr>
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<td>Other</td>
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<td>1.6–2.4</td>
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</tr>
<tr>
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<td>8.3–9.3</td>
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<td>Other</td>
<td>3.0</td>
<td>2.6–3.4</td>
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</tr>
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</table>

Comparative age-standardised analysis of regional data was limited to Maori because of insufficient numbers for Asian and Pacific peoples in many regions. This highlights significant regional variation, with Maori in Auckland having the highest prevalence, and Maori in Taranaki the lowest.

Table 4. Adult age standardised HBsAg prevalence for Maori by region

<table>
<thead>
<tr>
<th>Region</th>
<th>Prevalence (%)</th>
<th>95 % CI (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northland</td>
<td>5.6</td>
<td>4.9–6.3</td>
</tr>
<tr>
<td>Auckland</td>
<td>6.4</td>
<td>5.8–7.0</td>
</tr>
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<td>Waikato</td>
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<td>3.4–4.1</td>
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<td>Bay of Plenty</td>
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</tr>
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<td>Gisborne</td>
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<td>4.1–5.2</td>
</tr>
<tr>
<td>Hawke’s Bay</td>
<td>4.6</td>
<td>3.9–5.3</td>
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<td>Taranaki</td>
<td>2.6</td>
<td>1.6–3.6</td>
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<tr>
<td>Manawatu-Wanganui</td>
<td>6.2</td>
<td>4.4–8.0</td>
</tr>
<tr>
<td>Wellington</td>
<td>4.1</td>
<td>3.6–4.6</td>
</tr>
</tbody>
</table>

Discussion

To our knowledge, the New Zealand Hepatitis B Screening and Follow-Up Programme is the largest community-based hepatitis B screening programme ever conducted anywhere in the world, and provides the most robust HBsAg prevalence data available for Maori, Pacific, and Asian people in New Zealand. The programme in effect sampled 27% of the targeted populations. From a screening programme perspective, this is a disappointing result, especially in light of the initial target of 70% participation; however, experience from cervical and breast screening in New Zealand may not be directly comparable.
Zealand indicates that this target was always going to be difficult to attain within the time and resources available.

To obtain high participation levels, prolonged promotion and provision of the service is required. The national breast-screening programme, BreastScreen Aotearoa, for example, took 4 years to achieve 58% coverage, with considerably lower rates among Maori and Pacific women.\textsuperscript{20} The rapid growth in Asian communities in Auckland in the late 1990s and early 2000s made it even more challenging to achieve high levels of coverage among these groups.

Despite different recruitment models, both provider organisations achieved remarkably similar levels of coverage. The Hepatitis Foundation achieved higher rates of uptake than the Consortium in the areas where they had existing relationships with communities, such as the Bay of Plenty. However, there were some areas (for example in Taranaki) where they were less successful. The Consortium programme was most successful with Pacific populations in Auckland (especially among Tongans) and among smaller Maori communities in Northland but struggled to involve large numbers of urban Maori. More detailed accounts of the delivery models are being published elsewhere.

More than 10,000 (5.7% of the 177,328 people screened) tested positive for HBsAg. There were marked differences between and within ethnic group. For example, within Pacific and Asian populations prevalence varied markedly according to the region or country people originated from, and for Maori there were significant regional variations. The very high prevalence among Tongans (13%) is particularly concerning but it is pleasing that this group had the highest levels of coverage, approaching 50%.

Our findings align with previous studies in New Zealand showing men to have higher HBsAg prevalence than women, perhaps reflecting the predominant mode of transmission in these populations, which is hypothesised to be playground accidents in early childhood.\textsuperscript{5} The increasing HBsAg prevalence with age is almost certainly a cohort effect rather than reflecting new infections during adult life. The data do not support the previously reported north-south prevalence gradient.\textsuperscript{7,9}

There are several possible sources of bias in our analyses. We have assumed that prevalence rates in the participants reflect true community prevalence. However, only 27% of the target population was screened and the extent to which the screened group is representative of the total population is uncertain. This was not a survey of randomly selected individuals. Some participants may have participated because they perceived themselves or were considered by providers to be at ‘high risk’. This is certainly the case for children (under 15 years) and people identifying as ‘Other’ ethnic group who had higher rates than those previously reported, reflecting the fact that most were recruited (appropriately) as contacts of people with CHB.

Conversely, some participants may have been at lower risk of disease as is often the case with those who access preventive healthcare. As the real direction and extent of these effects is unknown and difficult to estimate, we have included simple sensitivity analyses around our prevalence estimates (Table 3) to provide a valid range within which the true prevalence is likely to lie. We also assumed that people who tested HBsAg-positive had CHB, a reasonable assumption because only a small number of HBsAg-positive adults in the target populations would be likely to have acute
infection. On balance, we believe that these data provide the best available estimates of CHB prevalence in these populations.

Screening programmes should not proceed unless effective interventions are available that will reduce the impact of the disease for either the community or the individual. In the case of hepatitis B, several effective interventions are now available that offer personal and public health benefits.

First, for those susceptible to hepatitis B, immunisation can be offered. Household and sexual contacts, in particular, should continue to be tested (and immunised if found to be non-immune because of their increased risk). The public health benefit of immunising susceptible adults at lower risk has been considered to be modest, due to the age-related reduction in likelihood of developing CHB after acute infection. However, immunisation of adults in high prevalence populations may be more worthwhile. Recent studies modelling hepatitis B transmission in endemic populations suggest that population protection may be afforded by much lower levels of immunisation coverage than previously thought, due to disruption of the positive feedback loop between age at infection and the proportion who develop CHB, that sustains endemicity at high levels.

Second, people with CHB should be advised to reduce alcohol consumption and to reduce behaviours that risk virus transmission to others (e.g. unprotected sex). The population benefit of such counselling to promote individual behaviour change should not be underestimated as small changes in behaviours that lead to a reduction in transmission could also lead to large differences in CHB prevalence over time.

Third, surveillance to detect the development of active hepatitis or of HCC in people with CHB can be offered. Hopkirk et al demonstrated that the risks of active disease and cirrhosis are moderately high in people with CHB in the Bay of Plenty. For some, treatment with interferon or lamivudine brings about sustained viral suppression and may prevent progression to cirrhosis and even HCC. The public health benefit of treatment should also not be underestimated: lamivudine therapy leads to a marked reduction in infectivity and could, if prescribed more widely to individuals in high prevalence groups, lead to a significant fall in CHB prevalence in a shorter time period than immunisation programmes promise because of the existence of a threshold prevalence effect, below which endemicity may settle to a lower level.

Finally, people diagnosed with early HCC can be offered resection or ablation of the tumour, or in some cases liver transplantation, with potential for improvements in life expectancy and/or quality of life. The evidence for the effectiveness of HCC screening using AFP alone or in combination with ultrasound is currently insufficient to support or refute it; but despite this, HCC screening is recommended practice among hepatologists.

A gap exists in hepatitis B control in New Zealand. Vigorous promotion of infant immunisation should continue to be the mainstay of the control strategy and the early management and follow-up testing of infants born to mothers with CHB optimised. Blood donor and antenatal screening should also continue. Screening for intending migrants is in the process of being introduced. Nevertheless, a pool of around at least 30 000 potentially infectious but unidentified people with CHB remains, and this means that eradication will take many generations to achieve, even with high levels of infant immunisation coverage.
Primary care providers should be supported through education and funding to give attention to opportunistic screening of people from known high-prevalence populations, to immunise susceptible individuals and arrange counselling, surveillance and specialist review of those with CHB where appropriate. As primary health organisations mature, such activities will be able to be undertaken in a more systematic way than has been the case to date.

The most pressing challenge arising from the Hepatitis B Screening Programme is to ensure that the more than 10,000 people identified with CHB receive appropriate follow-up surveillance and care. The Hepatitis Foundation is now engaged in this exercise with some success. However, many people are difficult to trace and have been lost to follow-up. Specialist services to which primary care providers can make referrals are lacking or difficult to access in some areas.

Have the benefits of this programme outweighed the costs? In the short term, it is impossible to judge, and without a randomised controlled trial of screening the verdict is unlikely to be clear-cut.

A system for monitoring medium-to-long term outcomes such as HCC and liver failure among the screened population has recently been established in conjunction with the screening and surveillance providers, the Ministry of Health and the Liver Transplant Unit. Such ongoing outcome monitoring from this unique programme will help to judge whether it has been an effective use of healthcare resources and to assess possible impacts on reducing hepatitis B prevalence and sequelae overall, together with any impact on ethnic group inequalities.

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**References:**


High rates of chlamydia in patients referred for termination of pregnancy: treatment, contact tracing, and implications for screening

Sally Rose, Beverley Lawton, Selina Brown, Felicity Goodyear-Smith, Bruce Arroll

Abstract

Aims To determine the rate of chlamydia and other sexually transmitted infections (STIs), and to describe treatment and factors associated with chlamydia in patients presenting for a termination of pregnancy (TOP).

Methods A retrospective audit of patients attending one of two TOP clinics from 1 February 2003. (Clinic A, n=500; Clinic B, n=501). Age, ethnicity, marital status, previous pregnancies, contraception, STIs, and treatment were recorded.

Results Ten percent of patients tested positive for an STI. Chlamydia was most commonly detected, in 7.7% of all patients. Higher rates of chlamydia were observed at clinic B (10.2% vs 5.2%, p=0.005) and in under 25 year olds (11.2% vs 3.6%, p<0.001). Rates of chlamydia in Pacific women were 18.6%, in Maori 12.9%, in Asian 7.3% and 4.4% in New Zealand European women. All patients testing positive for chlamydia were treated prior to TOP but only 41% of partners were treated. Other infections detected included 18 cases of human papillomavirus (HPV), three cases of trichomoniasis, one case of gonorrhoea, and one case of syphilis.

Conclusions There is a high rate of chlamydia in women presenting for TOP, particularly in under 25 year olds, Pacific, and Maori women. There is an immediate need for policymakers to respond to this increasing burden of chlamydia by instigating targeted education, guidelines, and mandatory chlamydia screening and contact tracing for pregnant women.
cause chronic pelvic pain, dyspareunia, infertility, and ectopic pregnancy. The risk of ascending upper-genital-tract infection during the surgical termination procedure is increased in the presence of untreated chlamydia. Testing for chlamydia and treating it prior to a TOP is therefore essential and (reportedly) cost-effective.

Internationally, rates of chlamydia detected in patients attending TOP clinics have varied. In the United Kingdom, rates range from 3.6% to 7.5% with up to 11.2% of patients under the age of 25 years testing positive for chlamydia. A two-clinic study of TOP patients in China showed 4.8% of 2020 patients were chlamydia-positive (mean age was 28 years). Higher rates have been reported the United States where 9.3% of 210 patients tested positive for chlamydia, and 11.7% of 1193 patients presenting to a Norwegian TOP clinic tested positive. Australia reports lower rates of chlamydia, with only 2.8% of 1175 patients testing positive for chlamydia.

The prevalence of STIs in women seeking a TOP in New Zealand is not known. A recent study in the New Zealand Medical Journal reported high rates of chlamydia in pregnant women, but that sample did not include terminated pregnancies. The study showed that only 37.5% of 6614 women had antenatal tests for chlamydia (4.8% testing positive overall), with higher rates in Maori (15.2%), Pacific (12.5%), and women under 25 years old (12.2%). Despite these high rates, New Zealand does not have guidelines advocating antenatal screening for chlamydia. Antenatal screening for chlamydia is current practice in the United States, and will be offered to pregnant women under the age of 25 attending antenatal clinics as part of the roll out of a national screening program in the United Kingdom.

This paper reports the outcome of a retrospective audit carried out in two demographically diverse TOP clinics with the following aims: to determine the rates of chlamydia and other STIs; to describe characteristics associated with chlamydia; and to describe treatment and contact tracing. This study will provide the first estimates of chlamydia rates in TOP patients, and will be an important step towards obtaining a more complete picture of chlamydia in pregnancy. The data can also be used inform the development of a national screening program in New Zealand.

Methods

Records for 1001 consecutive patients presenting to one of two New Zealand TOP clinics from 1 February 2003 were audited. Two clinics were involved: Clinic A (n=500) is a fee-paying clinic and clinic B (n=501) is a free Government-funded clinic.

De-identified retrospective data were entered into a Microsoft Access database by staff at each clinic. Data collected included age, self-reported ethnicity, marital status, previous pregnancies, termination procedure, sexually transmitted infections, and treatment, and self-reported use of contraception at the time of conception.

Determination of the presence of an STI was taken directly from laboratory test results present in patient notes. The laboratories used the Polymerase Chain Reaction (PCR) test (Amplicor CT/NG, Roche Diagnostics) to routinely detect C. trachomatis in both urine and swab samples. T. vaginalis and N. gonorrhoea were reported from endocervical or high vaginal swabs, and syphilitic serology used to test for syphilis. Data were analysed using Epi Info 2000 and Yates corrected Chi-squared tests for significance.

The local ethics committees deemed this an audit not requiring approval.
Results

The age range of patients was 13 to 48 years, (mean 25.5 years, SD 6.84, median 24 years). Patients did not differ by age between clinics, but differed significantly by ethnicity, marital status, and parity (see Table 1).

At Clinic A, over half (60%) of the patients were Asian (300/500); 57% of the patients were non-New Zealand residents (287/500), and 70% (202/287) of the non-residents were under 25 years of age. Residential status was not noted for Clinic B in this audit, but a subsequent check during a 3-month period at Clinic B revealed that less than 10% of attendees were non-New Zealand residents. Due to the differences observed in patient characteristics between clinics, data are presented separately for each clinic in Tables 1–3.

Rate of sexually transmitted infections—Overall, 10% (100/1001) of patients had an STI, with a higher rate among under 25 year olds (14.2% vs 5.2%, p<0.001). Chlamydia was the most commonly detected STI (77 cases); 18 cases of HPV were recorded, three cases of Trichomoniasis, one case of gonorrhoea, and one case of syphilis. No patients were diagnosed with multiple infections. The overall rate of infection differed significantly between clinics, with 13.4% of patients presenting with an STI at Clinic B (67/501), and 6.6% (33/500) of patients at Clinic A (p<0.001).

Overall, 42% (421/1001) of patients reported having used contraception at conception. Condoms were the most frequently reported form of contraception; with 60% (254/421) of patients who said they had used contraception reporting condom use.

Factors associated with chlamydia infection—The overall rate of chlamydia was significantly higher in patients presenting to Clinic B (10.2% vs 5.2%, p=0.005). Data presented in Table 2 show that younger age and self-reported ethnicity were significantly associated with chlamydia infection. Compared with New Zealand European, Maori and Pacific women had significantly higher rates of infection (p<0.001). Pairwise comparisons revealed that the higher rate of infection in Pacific women was not statistically higher than the rate observed in Maori women. Although Asian women appeared to have a higher rate of chlamydia infection than New Zealand European women, this difference did not reach statistical significance.

Having had a previous termination was associated with a significantly lower rate of chlamydia (p<0.05). Overall, a higher proportion of those who had previously undergone a termination were over the age of 25 years, so the lower rates of infection associated with previous TOP are likely to be explained age, as over 25 year olds have lower rates of chlamydia.

No association was observed between parity and rate of chlamydia infection (p>0.05). Marital status showed a significant association with chlamydia infection (p<0.05), with lower rates in women who reported being married or in a de facto relationship.

Data relating to treatment of those testing positive for chlamydia are presented in Table 3.
Table 1. Characteristics of patients presenting for termination of pregnancy (TOP) at one of two New Zealand clinics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Total sample (n=1001)</th>
<th>Clinic A (n=500)</th>
<th>Clinic B (n=501)</th>
<th>Test for significance between clinics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Zealand European</td>
<td>385</td>
<td>38.5</td>
<td>234</td>
<td>46.7</td>
</tr>
<tr>
<td>Maori</td>
<td>170</td>
<td>17.0</td>
<td>145</td>
<td>28.9</td>
</tr>
<tr>
<td>Pacific</td>
<td>70</td>
<td>7.0</td>
<td>57</td>
<td>11.4</td>
</tr>
<tr>
<td>Asian</td>
<td>343</td>
<td>34.3</td>
<td>43</td>
<td>8.6</td>
</tr>
<tr>
<td>Other</td>
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<td>2.8</td>
<td>18</td>
<td>3.6</td>
</tr>
<tr>
<td>Unknown</td>
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<td>0.5</td>
<td>4</td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Age band</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under 25 years</td>
<td>535</td>
<td>53.4</td>
<td>269</td>
<td>53.7</td>
</tr>
<tr>
<td>25 years and older</td>
<td>466</td>
<td>46.6</td>
<td>232</td>
<td>46.3</td>
</tr>
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<td><strong>Marital status</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single/never married</td>
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<td>54.9</td>
<td>299</td>
<td>59.7</td>
</tr>
<tr>
<td>Married</td>
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<td>15.2</td>
<td>93</td>
<td>18.6</td>
</tr>
<tr>
<td>Defacto</td>
<td>215</td>
<td>21.5</td>
<td>82</td>
<td>16.4</td>
</tr>
<tr>
<td>Separated/divorced</td>
<td>66</td>
<td>6.6</td>
<td>49</td>
<td>9.8</td>
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<tr>
<td>Widowed</td>
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<td>0.2</td>
</tr>
<tr>
<td>Not stated</td>
<td>14</td>
<td>1.4</td>
<td>11</td>
<td>2.2</td>
</tr>
<tr>
<td><strong>Procedure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical TOP</td>
<td>46</td>
<td>4.6</td>
<td>-</td>
<td>46</td>
</tr>
<tr>
<td>Surgical TOP</td>
<td>952</td>
<td>95.1</td>
<td>500</td>
<td>90.2</td>
</tr>
<tr>
<td><strong>Referrer</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General practitioner</td>
<td>800</td>
<td>79.9</td>
<td>373</td>
<td>74.6</td>
</tr>
<tr>
<td>Family planning</td>
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<td>14.9</td>
<td>94</td>
<td>18.8</td>
</tr>
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<td>Midwife</td>
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<td>0.1</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>Other</td>
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<td>4.1</td>
<td>8</td>
<td>1.6</td>
</tr>
<tr>
<td>Not known</td>
<td>10</td>
<td>1.0</td>
<td>10</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Parity</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Nulliparous</td>
<td>633</td>
<td>63.2</td>
<td>366</td>
<td>73.2</td>
</tr>
<tr>
<td>One child</td>
<td>140</td>
<td>14.0</td>
<td>55</td>
<td>11.0</td>
</tr>
<tr>
<td>Two or more children</td>
<td>228</td>
<td>22.8</td>
<td>79</td>
<td>15.8</td>
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<td><strong>Previous TOP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>670</td>
<td>66.9</td>
<td>349</td>
<td>69.8</td>
</tr>
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<td>One or more</td>
<td>331</td>
<td>33.1</td>
<td>151</td>
<td>30.2</td>
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<td><strong>Contraception use</strong></td>
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<td></td>
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<td>Condoms</td>
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<td>128</td>
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<tr>
<td>Other</td>
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<td>15.2</td>
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<td>16.4</td>
</tr>
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<td>58.0</td>
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<tr>
<td>Unknown</td>
<td>17</td>
<td>1.7</td>
<td>17</td>
<td>3.4</td>
</tr>
</tbody>
</table>

*Use of contraception at the ‘time of conception’ was the only data available from patient notes at the clinic.
Table 2. Rates of chlamydia and factors associated with infection in women presenting for termination of pregnancy (TOP)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Clinic A</th>
<th>Clinic B</th>
<th>Total sample</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>Total n</td>
<td>n</td>
</tr>
<tr>
<td>All patients</td>
<td>26</td>
<td>5.2</td>
<td>500</td>
<td>51</td>
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<td><strong>Age-band</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Under 25 years</td>
<td>21</td>
<td>7.9</td>
<td>266</td>
<td>39</td>
</tr>
<tr>
<td>25 years and older</td>
<td>5</td>
<td>2.1</td>
<td>234</td>
<td>12</td>
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<td><strong>Ethnicity</strong></td>
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<td></td>
<td></td>
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<tr>
<td>New Zealand European</td>
<td>4</td>
<td>2.6</td>
<td>151</td>
<td>13</td>
</tr>
<tr>
<td>Maori</td>
<td>1</td>
<td>4.0</td>
<td>25</td>
<td>21</td>
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<td>-</td>
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<td>13</td>
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<tr>
<td>Asian</td>
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<td>Other/not stated</td>
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<td>11</td>
<td>0</td>
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<td><strong>Previous TOP</strong></td>
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<td></td>
<td></td>
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<tr>
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<td>22</td>
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<td>349</td>
<td>39</td>
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<tr>
<td>One or more</td>
<td>4</td>
<td>2.7</td>
<td>151</td>
<td>12</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Single/never married/widowed or divorced</td>
<td>17</td>
<td>6.3</td>
<td>271</td>
<td>42</td>
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<tr>
<td>Married or De facto</td>
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<td>226</td>
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</tr>
<tr>
<td>Not stated</td>
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<td>-</td>
<td>3</td>
<td>1</td>
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</table>

*Chi-squared test for significance compared infection rates in the total sample for each of the variables listed

Table 3. Treatment of patients who tested positive for chlamydia on referral for termination of pregnancy (TOP)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Clinic A (26 cases)</th>
<th>Clinic B (51 cases)</th>
<th>Total sample (77 cases)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td><strong>Treated for chlamydia</strong></td>
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<td></td>
</tr>
<tr>
<td>Yes</td>
<td>26</td>
<td>100</td>
<td>49</td>
</tr>
<tr>
<td>Not recorded</td>
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<td>2</td>
</tr>
<tr>
<td><strong>Treatment type</strong></td>
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<td>Azithromycin</td>
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<tr>
<td>Other</td>
<td>5</td>
<td>19.2</td>
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</tr>
<tr>
<td>Not recorded</td>
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<td>-</td>
<td>3</td>
</tr>
<tr>
<td><strong>Treated by</strong></td>
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<td></td>
<td></td>
</tr>
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<td>TOP clinic</td>
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<td>30</td>
</tr>
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<td>General practitioner</td>
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<td>Family planning</td>
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<tr>
<td>Other</td>
<td>1</td>
<td>3.8</td>
<td>-</td>
</tr>
<tr>
<td>Not recorded</td>
<td>-</td>
<td>-</td>
<td>2</td>
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<tr>
<td><strong>Partner treated</strong></td>
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<td></td>
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<td>Yes</td>
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<td>16</td>
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<tr>
<td>Not recorded</td>
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<td>38.5</td>
<td>35</td>
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</table>
Discussion

Overall, 10% of the patients included in this audit tested positive for an STI, with 13.4% of patients at Clinic B testing positive for an infection. As expected, chlamydia was the most commonly detected STI, with the burden of disease carried by under 25 year olds, Maori, and Pacific women. Treatment for chlamydia was documented in all except two patients prior to termination, but there was no evidence of partner treatment in over half of those cases. Together with data from an audit of chlamydia in pregnancy, these data point to the need for routine antenatal chlamydia testing. Pregnant women are an easily targeted group for whom undetected infection has potentially serious health consequences. These data also highlight the need to target resources and education towards high-risk groups if the rates of sexually transmitted infection are to decrease in the foreseeable future.

The overall rate of chlamydia in this audit is comparable with international rates in TOP clinics, but is markedly higher than the rate reported in an audit of completed pregnancies in New Zealand (7.7% vs 4.8%). This is consistent with the view that women with an unwanted pregnancy are at greater risk for infection. A direct comparison between rates obtained in audits of completed and terminated pregnancies has limitations including data collection at different time periods; older average age (30.6 years) and incomplete testing for women with completed pregnancies (37.5%). Despite these limitations, the high rate of chlamydia in both groups of pregnant women in New Zealand is disturbing, and points to the need for routine testing for the infection in pregnancy. An audit that involves all TOP clinics, as well as all antenatal data would be useful in providing a complete picture of chlamydia in pregnancy in New Zealand.

The overall rate of chlamydia at Clinic B was approximately twice that of Clinic A. Clinic B is a Government-funded clinic that performs approximately 17% of all terminations in New Zealand. By contrast, Clinic A is a fee-paying clinic that performs approximately 9% of the total terminations, and had a disproportionately higher number of Asian patients than Clinic B. Results from Clinic A might therefore be less generalisable to women attending TOP clinics nationally.

Asian women have not previously been identified as an at-risk group in New Zealand—rates of chlamydia for Asian women were 14 times higher in this audit than in the audit of completed pregnancies. This finding is disturbing and raises further questions about the reasons behind the high rates of infection. Risk factors that were not identified in this audit, such as socioeconomic variables, number of (new) partners, and patterns of contraceptive use might contribute to the marked difference in infection rates observed between age- and ethnic groups.

Treatment for chlamydia infection occurred in all but two cases in which details regarding treatment were not documented in the patient’s notes. Eighty percent of patients were referred for TOP from primary care by general practitioners (GPs), but only 42% of those patients testing positive for chlamydia were treated by the GP. Details regarding treatment of sexual partners were not routinely noted, with less than half of patient records indicating that partner treatment had occurred. Contact tracing
and treatment of all sexual partners is essential to prevent re-infection, particularly because of the asymptomatic nature of the disease.\textsuperscript{20} Inadequate resourcing, a lack of clarity regarding responsibility for contact tracing, or incomplete recording of partner treatment by clinic staff may be factors that explain the low rate of partner treatment. These findings highlight the urgent need for a protocol between referring health professionals and TOP clinics that clearly outlines responsibilities for the detection, treatment, contact tracing, and follow-up of women and their partners.

In the United Kingdom, the need to combat rising rates of chlamydia saw the introduction of pilot screening programs that are now being rolled out nationally.\textsuperscript{21} By contrast, policy makers in New Zealand have been slow to respond to the rising rate of chlamydia, with no national guidelines or screening programs in place. Data presented here can be used to inform the development and implementation of a national guideline for the management of chlamydia infection, as well as a screening program that includes pregnant women as a target population.

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References:


Sexually transmitted infections in New Zealand in 2003

Alisha Johnston, Dinusha Fernando, Graham MacBride-Stewart

Abstract

Aims To describe the current burden and trends of sexually transmitted infections (STIs) in New Zealand (NZ) since 1999, as reported by current surveillance methods.

Methods Clinic rates were calculated by dividing the number of diagnoses by the total number of clinic visits. Laboratory rates were calculated using the NZ Census 2001 population data for the Auckland, Waikato, and Bay of Plenty regions.

Results In 2003, chlamydia was the most commonly diagnosed STI in sexual health (SHCs) and family planning clinics (FPCs), followed by genital warts. Laboratory surveillance reported a chlamydia rate of 653.0 per 100,000 population and a gonorrhoea rate of 90.2 per 100,000 population. The highest rates of chlamydia and gonorrhoea were in the 15 to 19 years age group. From 2002 to 2003, both chlamydia and gonorrhoea cases have increased by 14.0% in SHCs. In FPCs, chlamydia increased by 25.9% and gonorrhoea increased by 11.4%. Since 2002, numbers of chlamydia and gonorrhoea cases have increased by 14.0% in SHCs and by 25.9% and 11.4%, respectively, in FPCs. Maori and Pacific Peoples continue to be disproportionately affected by STIs.

Conclusions Current national surveillance methods are unrepresentative of the NZ population and do not provide accurate estimates of the population burden of STIs. Expansion of laboratory surveillance (to accurately reflect all areas of NZ) is needed and is currently under active consideration.

Sexually transmitted infections (STIs) are a major global cause of morbidity and infertility with significant sequelae. In New Zealand, rates of STIs, in particular genital chlamydia (Chlamydia trachomatis) and gonorrhoea (Neisseria gonorrhoeae) are steadily increasing.1,2

In New Zealand, STIs (with the exception of AIDS) are non-notifiable diseases. Surveillance of STIs has been based on voluntary data from specialist sexual health clinics. Since mid-1998, surveillance has progressively expanded to include family planning clinics, student and youth health clinics, and several laboratories in the Waikato, Bay of Plenty, and Auckland regions of New Zealand’s North Island.

This paper adds to previously published STI data3,4 by reporting surveillance data on STIs from both clinic and laboratory sources in 2003 and examining trends from 1999. This data provides an indication of the current burden and populations at risk of STIs in New Zealand and highlights some limitations of the current surveillance system.
Methods

Data sources

Clinic data—The case definitions of STIs under surveillance are as previously described. All participating sexual health clinics (SHCs), family planning clinics (FPCs), and student and youth health clinics (SYHCs) report the total number of clinic attendances and anonymised data on the age, sex, and ethnicity of cases. Clinics send data to the Institute of Environmental Science and Research Ltd. (ESR) each month—either directly, or via a regional co-ordinator. In 2003, STI data was received from 25 SHCs, 42 FPCs, and 15 SYHCs. SYHC data is not presented here, as the data collected is not representative of all SYHCs; also of the SYHCs that do report, many provide incomplete data. The location of participating clinics is illustrated in Figure 1.

Laboratory data—Ten laboratories in the Waikato, Bay of Plenty, Lakes, Counties Manukau, and Auckland District Health Boards (DHBs) provide data to ESR. This includes approximately two-thirds of the microbiology laboratories in these DHBs. The DHBs where laboratories participate in STI surveillance is illustrated in Figure 2. Gonorrhoea diagnoses were by culture and nucleic acid amplification test (NAAT), [one laboratory used strand displacement amplification (SDA)]. Chlamydia diagnoses were by NAATs [eight laboratories used polymerase chain reaction (PCR), one laboratory used both PCR and enzyme linked immunosassay (EIA), and one laboratory used SDA]. Laboratories report anonymised age and sex data for chlamydia and gonorrhoea cases. As patient identifiable information is not collected, it is not possible to differentiate an infection isolated from two different sites in one patient or from one patient diagnosed in two clinical settings—e.g. if the same patient presents at a GP and is then referred to a SHC. These factors may result in duplicate reporting and so the calculated infection rates may be higher than the true rate.

Data analysis

Clinic rates—Rates based on clinic data use the total number of clinic visits, whether for STIs or other conditions, as the denominator. It is not possible to use the number of patients tested for STIs as the denominator because this is not reported.

Laboratory positivity and rates—The total number of specimens tested for chlamydia was used to calculate the chlamydia positivity rate. It is not possible to calculate the positivity by sex or age because only the total number of specimens tested is reported. The total number of specimens tested for gonorrhoea in 2003 was not available. Estimated population rates were calculated by dividing the number of cases by the total ‘usually resident’ population data from the New Zealand Census 2001 for the relevant DHBs. For chlamydia rates this also included the population in the Waitemata DHB as the chlamydia data submitted by one laboratory in the Auckland DHB includes specimens from Waitemata DHB. Because all data were recorded with an anonymous identifier it was not possible to link data on clinic attendees with laboratory results. For categorical variables, multiway contingency table analyses were used to calculate the proportions. A robust method of constructing 95% confidence intervals and Chi-squared statistics were used to determine statistically significant difference across age, sex, and ethnicity strata. Univariate analyses were performed to test for significance in trends. Analyses were completed using Statistical Analysis Software (SAS) version 8.2.

Results

In 2003, there were 81,356 SHC visits (59.5% female) and 191,651 FPC visits (96.1% female). The majority of attendees were aged less than 25 years (51.7% in SHCs; 64.7% in FPCs) and of European ethnicity (69.5% in SHCs; 66.0% in FPCs).

Chlamydia was the most commonly diagnosed STI in both clinical settings, accounting for 39.2% and 66.3% of all confirmed STI diagnoses in SHCs and FPCs, respectively. This was followed by genital warts (35.9% of STI cases in SHCs; 19.3% in FPCs). Table 1 shows the number of cases and rates of chlamydia, gonorrhoea, genital warts, and genital herpes diagnosed in SHCs and FPCs. In 2003, there were 1062 non-specific urethritis (NSU) cases in SHCs, and 9 cases in FPCs. SHCs also
reported 30 cases of infectious syphilis in 2003. Clinic infection rates were higher in males than females for all age groups (Table 1).

In 2003, participating laboratories reported 11,525 chlamydia cases (positivity 7.2%, rate 653.0 per 100,000) and 1204 gonorrhoea cases (rate 90.2 per 100,000). Females accounted for 72.1% of chlamydia cases and 40.3% of gonorrhoea cases. The majority of cases were in people less than 25 years old (67.4% of chlamydia and 60.0% of gonorrhoea cases) (Table 2). Laboratory surveillance rates of gonorrhoea were highest in males whereas the highest rates of chlamydia were in females. In 2003, the highest rates of chlamydia and gonorrhoea were found in the 15 to 19 years age group, in both clinic and laboratory surveillance (Table 1 and 2). Laboratory surveillance rates of chlamydia and gonorrhoea in this age group were four times higher than the overall rate. In 2003, there were 51 cases of neonatal chlamydia infection and 2 cases of neonatal gonorrhoea infection. (This has decreased since 2002, when 96 cases of neonatal chlamydia and 4 cases of neonatal gonorrhoea infection were reported.) In SHCs, the highest rates of genital warts were in the 20 to 24 year age group; the highest rates of genital herpes in the greater than 29 years age group and the highest rate of NSU in males in the 25 to 29 years age group. In FPCs, the highest rate of genital warts was in the 15 to 19 years age group.

Infection rates in the clinical settings varied by ethnicity (Table 3). Rates of chlamydia were significantly higher in Maori and Pacific Peoples than in those of European ethnicity. In SHCs, gonorrhoea rates were also significantly higher in these groups compared to those of European ethnicity, while rates of genital herpes were significantly higher in the European group. There was no significant difference in the rates of genital warts by ethnicity.

Since 1999, the number of chlamydia and gonorrhoea cases diagnosed at SHCs has significantly increased (Figure 3). This trend may, in part, be due to the increasing the number of clinic attendances (54,992 in 1999, 81,356 in 2003). Increasing numbers of STIs are also seen at FPCs (Figure 4); however between 1999 and 2000, the number of participating FPCs increased 10-fold causing the number of reported attendances to increase from 6931 in 1999 to 191,651 in 2003.

Since 2001, there have been no major changes to clinical surveillance. Between 2002 and 2003, the number of clinic attendances changed only slightly in SHCs (<0.1% increase) and decreased by 3.6% in FPCs. Over the same period, the number of chlamydia cases reported by SHCs and FPCs increased significantly (by 14.0% and 25.9% respectively, p<0.0001). The number of gonorrhoea cases also increased (14.0% in SHCs and 11.4% in FPCs), but only the change at the SHCs was of statistical significance (p<0.05). Between 2002 and 2003, the number of genital warts cases decreased in SHCs (by <0.1%) and FPCs (by 7.9%), but this change was not statistically significant. In SHCs the number of NSU and infectious syphilis cases also decreased (by 5.6% and 36.2% respectively (not significant)) in 2003 compared to 2002. Since 1999, laboratory surveillance has reported increases in chlamydia (p<0.05) and gonorrhoea (p>0.05) rates in the Auckland, Waikato, and Bay of Plenty regions (Figure 5). However between 1999 and 2000, the number of laboratories reporting gonorrhoea results increased from 9 to 10. Between 2000 and 2001, the number of laboratories reporting chlamydia increased from 7 to 10. From 2001, there have been no major changes in the participating laboratories; between 2002 and 2003 chlamydia and gonorrhoea rates increased by 12.1% and 21.4% respectively (p<0.05).
Figure 1. District Health Boards (DHBs) in New Zealand where sexual health clinics and family planning clinics participate in the surveillance of sexually transmitted infections (2003)
Figure 2. District Health Boards (DHBs) in New Zealand where laboratories participate in the surveillance of sexually transmitted infections (2003).
Figure 3. Number of confirmed sexually transmitted infections diagnosed in sexual health clinics in New Zealand: 1999–2003
Figure 4. Number of confirmed sexually transmitted infections diagnosed in family planning clinics in New Zealand: 1999–2003

- Chlamydia
- Gonorrhoea
- Herpes
- Warts
- NSU (Males Only)
- Syphilis
Figure 5. Rates of chlamydia and gonorrhoea reported through laboratory surveillance in the Auckland, Waikato, and Bay of Plenty regions: 1999–2003
Table 1. Number and clinic rates of confirmed chlamydia, gonorrhoea, genital herpes and genital warts diagnoses in sexual health and family planning clinics, by age group and sex: 2003

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>Sex</th>
<th>Sexual Health Clinics</th>
<th>Family Planning Clinics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Chlamydia</td>
<td>Gonorrhoea</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No.</td>
<td>Rate (%)</td>
</tr>
<tr>
<td>10-14</td>
<td>Male</td>
<td>2</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>66</td>
<td>6.8</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>68</td>
<td>6.4</td>
</tr>
<tr>
<td>15-19</td>
<td>Male</td>
<td>368</td>
<td>11.5</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>988</td>
<td>6.4</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1356</td>
<td>7.3</td>
</tr>
<tr>
<td>20-24</td>
<td>Male</td>
<td>716</td>
<td>7.9</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>668</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1384</td>
<td>6.1</td>
</tr>
<tr>
<td>25-29</td>
<td>Male</td>
<td>356</td>
<td>5.5</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>237</td>
<td>3.2</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>593</td>
<td>4.3</td>
</tr>
<tr>
<td>30+</td>
<td>Male</td>
<td>319</td>
<td>2.3</td>
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<tr>
<td></td>
<td>Female</td>
<td>156</td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>475</td>
<td>1.9</td>
</tr>
<tr>
<td>All‡</td>
<td>Male</td>
<td>1761</td>
<td>5.3</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>2116</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3876</td>
<td>4.8</td>
</tr>
</tbody>
</table>

†First diagnosis; ‡Includes cases of all and unknown age.
Table 2. Number and rates of chlamydia and gonorrhoea reported by participating laboratories in the Auckland, Waikato, and Bay of Plenty regions, by age and sex: 2002–2003

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>Sex</th>
<th>Chlamydia</th>
<th>gonorrhoea</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2002</td>
<td>2003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rate†</td>
<td>Rate†</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2002</td>
<td>2003</td>
</tr>
<tr>
<td>10-14</td>
<td>Male</td>
<td>7</td>
<td>9.9</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>134</td>
<td>196.4</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>141</td>
<td>101.4</td>
</tr>
<tr>
<td>15-19</td>
<td>Male</td>
<td>583</td>
<td>1194.1</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>2653</td>
<td>5615.5</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3236</td>
<td>3368.5</td>
</tr>
<tr>
<td>20-24</td>
<td>Male</td>
<td>919</td>
<td>2073.0</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>2301</td>
<td>4984.7</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3220</td>
<td>3558.3</td>
</tr>
<tr>
<td>25-29</td>
<td>Male</td>
<td>530</td>
<td>1190.1</td>
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<tr>
<td></td>
<td>Female</td>
<td>1121</td>
<td>2283.7</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1651</td>
<td>1763.5</td>
</tr>
<tr>
<td>30+</td>
<td>Male</td>
<td>743</td>
<td>211.7</td>
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<tr>
<td></td>
<td>Female</td>
<td>1173</td>
<td>302.7</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1916</td>
<td>259.4</td>
</tr>
<tr>
<td>All *</td>
<td>Male</td>
<td>2833</td>
<td>329.5</td>
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<tr>
<td></td>
<td>Female</td>
<td>7445</td>
<td>822.5</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>10284</td>
<td>582.7</td>
</tr>
</tbody>
</table>

†Rate per 100 000 population; ‡Significance testing comparing 2003 to 2002 data. Y=result is significant, p<0.05; *Includes cases of unknown age; †Includes cases of unknown sex.
Table 3. Number and clinic rates of chlamydia, gonorrhoea, genital herpes and genital warts diagnosed in sexual health and family planning clinics, by ethnicity: 2003

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Sexual Health Clinics</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Family Planning Clinics</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chlamydia</td>
<td>Gonorrhoea</td>
<td>Herpes</td>
<td>Warts</td>
<td>Chlamydia</td>
<td>Gonorrhoea</td>
<td>Herpes</td>
<td>Warts</td>
<td>Chlamydia</td>
<td>Gonorrhoea</td>
</tr>
<tr>
<td>European</td>
<td>2060</td>
<td>3.6</td>
<td>213</td>
<td>0.4</td>
<td>575</td>
<td>1.0</td>
<td>2576</td>
<td>4.6</td>
<td>924</td>
<td>0.7</td>
</tr>
<tr>
<td>Maori</td>
<td>1365</td>
<td>9.1</td>
<td>260</td>
<td>1.7</td>
<td>106</td>
<td>0.7</td>
<td>619</td>
<td>4.1</td>
<td>271</td>
<td>2.0</td>
</tr>
<tr>
<td>Pacific</td>
<td>256</td>
<td>10.0</td>
<td>83</td>
<td>3.2</td>
<td>13</td>
<td>0.5</td>
<td>110</td>
<td>4.3</td>
<td>107</td>
<td>1.8</td>
</tr>
<tr>
<td>Other</td>
<td>173</td>
<td>2.8</td>
<td>46</td>
<td>0.7</td>
<td>55</td>
<td>0.9</td>
<td>202</td>
<td>3.2</td>
<td>264</td>
<td>1.1</td>
</tr>
<tr>
<td>Unknown</td>
<td>23</td>
<td>2.1</td>
<td>7</td>
<td>0.6</td>
<td>8</td>
<td>0.7</td>
<td>37</td>
<td>3.3</td>
<td>162</td>
<td>0.7</td>
</tr>
</tbody>
</table>

†First diagnosis
Discussion

Both SHCs and FPCs play a vital role in the provision of sexual health services, however the total burden of STIs in New Zealand is likely to be substantially higher than that presented here, as a large proportion of the population attend other healthcare settings (such as general practice) for their sexual health.\textsuperscript{6,7} In those regions where both laboratory and clinical based surveillance are in place, the number of chlamydia and gonorrhoea cases is 50\% higher in laboratories compared to clinics.\textsuperscript{4} This suggests a significant proportion of cases are diagnosed in healthcare settings not currently under clinic surveillance (e.g. primary care).

Another factor influencing clinic rates may be the use of total clinic visits as the denominator in rate calculations. Participating clinics do not report the number of patients tested for STIs, therefore the number of clinic visits is the only denominator available to calculate rates. However, as no distinction is made between the reasons for clinic visits, the denominator may result in an underestimation of the true STI rate.

Laboratory surveillance is currently only in place in the Auckland, Waikato, and Bay of Plenty regions, an area covering 47.2\% of the New Zealand population. In 2003, laboratory surveillance estimated a chlamydia rate of 653.0 per 100,000 population in these regions—an increase of 12.1\% from 2002. Cross-sectional studies in New Zealand report similar high rates of chlamydia—e.g. 4.8\% in pregnant women,\textsuperscript{8} 11.7\% (11.1\% males and 12.6\% females) in SHC attendees,\textsuperscript{9} and 4.0\% in male army recruits.\textsuperscript{10}

The rate of chlamydia in these regions is now more than four times higher than the most recent figures available (2002 data) for Australia\textsuperscript{11} and the United Kingdom (UK)\textsuperscript{12} (excluding Scotland). The rate of gonorrhoea is now 90.2 per 100,000 population in these regions, more than double that in Australia\textsuperscript{11} and the UK\textsuperscript{12} (excluding Scotland). However, it is important to note there are differences in surveillance methods between countries; for example in the UK, STI reporting is mandatory and surveillance is based on a network of genitourinary medicine clinics, whereas in Australia STIs are notifiable diseases and surveillance is based on a combination of both clinic and laboratory data.

In New Zealand, STIs are not notifiable diseases and current surveillance coverage is incomplete. Although laboratory surveillance can provide us with a better estimate of the burden of STIs in the population, it encompasses only 75\% of laboratories in the Auckland, Waikato, and Bay of Plenty regions and is not representative of the whole country. Furthermore, as a large percentage of chlamydia and gonorrhoea cases are asymptomatic,\textsuperscript{13,14} patients may remain undiagnosed resulting in underestimation of the true population infection rates.

Since 1999, the numbers of chlamydia and gonorrhoea cases diagnosed at SHCs have increased by 92.0\% and 68.2\%, respectively. Over the same period, the number of attendances at SHCs increased by 47.9\%. For FPCs, comparisons with years prior to 2001 are difficult, due to a 10-fold increase in the number of participating FPCs between 1999 and 2000. Since 2001, the number of chlamydia diagnoses at FPCs has increased, but there has been little change in the number of gonorrhoea cases.

Increasing rates of STIs are of significant public health concern, not only because untreated STIs can lead to the development of serious sequelae\textsuperscript{13} but also because of
their ability to facilitate the transmission of HIV.\textsuperscript{15,16} The prevalence of ciprofloxacin-resistant gonorrhoea has also reached a level surpassing that acceptable as first-line treatment,\textsuperscript{17} which may have important consequences for the treatment and management. In the 1990s, increases in STI incidence in New Zealand were attributed to a number of factors including a greater professional awareness,\textsuperscript{18} changes to service provision and attendance patterns, and the introduction of more sensitive and specific diagnostic techniques. Whereas from 2000, increases may be more indicative of changes in sexual behaviour.\textsuperscript{19}

In the United Kingdom, where the incidence of STIs is also increasing,\textsuperscript{12} the \textit{National Survey of Sexual Attitudes and Lifestyles} indicated increasing trends towards risky sexual behaviour.\textsuperscript{20} Such behaviour included an increased number of partners, increased frequency of partner change, and reduced condom use. National studies reporting high-risk sexual behaviour have also been completed in Australia\textsuperscript{21,22} and the United States.\textsuperscript{23}

The highest rates of STIs in clinic surveillance are in males. This may merely reflect that males are more likely to have symptomatic infections and so are more likely to seek treatment. High rates in male FPC attendees may also be due to the low percentage of men attending FPCs. In addition, the majority of males attending FPCs are targeted through partner notification, and more likely to have a positive diagnosis. Laboratory surveillance reports higher rates of chlamydia in females than males; this may be a result of females attending other healthcare settings (e.g. for routine cervical screening), thus providing the opportunity to screen for asymptomatic infections.

In New Zealand, as reported in other industrialised countries,\textsuperscript{11,12} surveillance data indicates the highest burden of STIs are in young people and non-European ethnic groups. Young people have more sexual partners, change partners more frequently,\textsuperscript{19,24,25} and are at greater risk of re-infection.\textsuperscript{26} Furthermore, a significant proportion of young people do not always practice safe sex,\textsuperscript{27} putting them at risk of acquiring an STI. A school-based survey in Christchurch, New Zealand reported 4.1% of female and 0.4% of male sexually-active students had a previous STI diagnosis, and 56% reported that they did not always use a condom.\textsuperscript{28} Targeted intervention and education strategies directed at reducing high-risk sexual behaviour and programmes to improve young peoples skills and confidence to implement behavioural changes are few. The frequency of such programmes needs to be increased with adequate funding and training.

STI surveillance data and other studies\textsuperscript{8,9,29} continue to report that the Maori and Pacific People populations are disproportionately effected by poor sexual health. Difficulties in accessing services have been identified for Maori and others,\textsuperscript{30} and it has been shown that Maori are significantly less likely to attend a GP at least once in a year.\textsuperscript{31} In other countries where rates of STIs are higher amongst certain ethnic groups, factors in addition to access to healthcare have been implicated. These include differences in sexual behaviour and sexual networks.\textsuperscript{32,33}

Current surveillance provides valuable information on the trends of STIs and the populations at risk, but difficulties are met when trying to establish national baselines and applying the data to the general population. This, along with the lack of a suitable denominator for rate calculations, means it cannot provide useful estimates of the true population burden of STIs. There is an urgent need for robust and reliable information
to inform and monitor control and prevention initiatives. One way is by expanding laboratory surveillance to all areas of New Zealand. (ESR and the Ministry of Health are currently in discussions with laboratories and Public Health Units about this.)

Many STIs are easy to diagnose and treat effectively with antibiotics, yet STI rates continue to increase. Sustained high rates of STIs among young people and Maori and Pacific Peoples indicate there is the need for more innovative approaches to the development of effective sexual health campaigns. The Ministry of Health’s ‘Sexual and Reproductive Health, A resource book for New Zealand health care organisations’ is a step in the right direction, but now is the time to implement the suggested strategies and to move from planning to unified action. For example, in New Zealand the high rate of chlamydia, including infections in neonates, reinforces the need for appropriately resourced chlamydia screening guidelines for healthcare professionals. Indeed, in other industrialised countries, this approach accompanied by opportunistic testing for chlamydia, has been shown to reduce chlamydia prevalence.

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References:


Is syphilis resurgent in New Zealand in the 21st century? A case series of infectious syphilis presenting to Auckland Sexual Health Service

Sunita Azariah

Abstract

Bacterial sexually transmitted infections such as chlamydia and gonorrhoea have been on the rise in recent years in New Zealand. Infectious syphilis has however remained rare over the last few decades, except in New Zealanders who have had sex overseas or in recent immigrants. However, in the previous 2 and a half years (1/2002–9/2004), the number of people presenting to Auckland Sexual Health Service with infectious syphilis has more than doubled.

The main people at risk for acquiring infectious syphilis appear to be either men who have sex with men, or heterosexuals who have recently had sex overseas. More information is urgently required about the epidemiology of syphilis in New Zealand. One expedient way to determine whether we have an emerging epidemic would be to make syphilis a notifiable condition.

There has been an alarming rise in the incidence of bacterial sexually transmitted infections (STI) in New Zealand in recent years. The last annual STI surveillance report produced by Environmental Science and Research Ltd (ESR) in 2003 indicated a 65.5% increase in the incidence of chlamydia and a 57% rise in the incidence of gonorrhoea since 1999.1 Infectious syphilis, however, has (until recently) remained a relative rarity, except for occasional cases in New Zealanders who have had sex overseas or in immigrants from endemic areas. In 2003, a total of 30 cases of infectious syphilis were reported to ESR: all seen at sexual health clinics.1 The majority of cases were in males (63.3%). In the first ESR quarterly report for 2004 (January to March), 10 cases have been reported, again the majority (70%) were men.

Unfortunately there is currently no way to verify whether the incidence of infectious syphilis in New Zealand is increasing. Unlike chlamydia and gonorrhoea, there is no laboratory surveillance of syphilis nor is it a notifiable disease—although individuals that refuse treatment may be referred to the medical officer of health under the Health Act of 1956.

Another complicating factor is that the symptoms and signs of primary and secondary syphilis may be very subtle (or easily confused with other conditions), and most medical practitioners in New Zealand (including sexual health physicians) have very little practical experience of the disease. Indeed, some incubating cases may never be identified due to inadvertent partial treatment with antibiotics prescribed for other conditions.

In the previous 2 and a half years (between January 2002 and September 2004), there appears to have been more cases of infectious syphilis presenting to Auckland Sexual Health Service. This article comprises clinical information about all the cases of
A total of 40 cases of infectious syphilis were identified and verified as fitting the case definitions during the defined time period. That was more than twice as many cases as had been diagnosed in the preceding 4 years (19 cases). The cases ranged in age from 19 to 63, with a mean age of 34.2 years. The majority (82.5%) of cases were in males: reflecting similar trends to national data. The ethnic breakdown was as
follows: 17 Europeans (42.5%), 4 New Zealand Maori (10%), 5 Indians (12.5%), 6 Pacific Islanders (15%), 5 Asian (12.5%), 2 ethnic Fijians (5%), and 1 Latin American (2.5%).

Fourteen cases presented with some sort of genital ulceration or genital lesion as well as having positive STS (one case couldn’t have a complete genital examination on initial presentation due to a phimosis). Nine (22.5% of total) of these cases were confirmed primary syphilis as the lesions tested positive for *Treponema pallidum pallidum* by DFA testing. Three of these cases also had positive dark-field microscopy. Enzyme immunoassay was 100% sensitive for all these 9 confirmed cases of primary syphilis but RPR (sensitivity 77.7%) and TPHA (sensitivity 66.6%) yielded some false negative results (Table 1).

**Table 1 Confirmed direct fluorescent antibody (DFA)-positive cases of primary syphilis**

<table>
<thead>
<tr>
<th>Case</th>
<th>EIA result</th>
<th>TPHA result</th>
<th>RPR result</th>
<th>Dark field microscopy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Positive</td>
<td>Positive</td>
<td>Equivocal</td>
<td>ND</td>
</tr>
<tr>
<td>2</td>
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<td>ND</td>
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<td>Positive</td>
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<td>4</td>
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<td>Positive</td>
<td>1:8</td>
<td>Negative</td>
</tr>
<tr>
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<td>Positive</td>
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<td>Positive</td>
</tr>
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<td>Positive</td>
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<td>ND</td>
</tr>
<tr>
<td>9</td>
<td>Positive</td>
<td>Positive</td>
<td>1:1</td>
<td>ND</td>
</tr>
</tbody>
</table>

EIA=enzyme immunoassay test; TPHA=*Treponema pallidum* haemaglutination assay test; RPR=rapid plasma reagin test; ND=not done.

**Sensitivities of different STS for primary syphilis**

EIA=100% (9/9)

TPHA=66.6% (6/9)

RPR=77.7% (7/9)

Fourteen (35%) of the total cases presented with a generalised rash and were considered to be secondary syphilis. In all 14 identified cases of secondary syphilis, all of the STS were positive (EIA, TPHA and RPR) and all had high RPR titres ranging from 1:16 to 1:128.

Twelve cases had no symptoms or signs consistent with primary or secondary syphilis and were managed as early latent syphilis with respect to partner notification—because they had high RPR titres, they were recent contacts of infectious syphilis, or they had had recent documented treatment overseas with inadequate sero-reversal.

In all cases of early latent syphilis, all three STS were uniformly positive, with RPR titres ranging from 1:4 to 1:2560 (mean 304). Determining the duration of infection was difficult in some cases, as there was no previous documented syphilis serology. All cases of syphilis of unknown duration received treatment and follow-up as recommended for late latent syphilis.
The two main risk factors identified for acquisition of infectious syphilis appeared to be either: a history of sex overseas within the last 3 months or men who had sex with men (MSM). There were 19 cases (47.5%) who had a history of sex overseas and 18 cases (45%) who were MSM. There was very little overlap between these two main risk categories. The 19 people who gave a history of sex overseas within 3 months of presentation were nearly all heterosexual (68.4%). The most commonly cited country for overseas sex was Fiji, which is known to have a high prevalence of syphilis. (Table 2)

Table 2. Cases of infectious syphilis acquired overseas

<table>
<thead>
<tr>
<th>Gender</th>
<th>Ethnicity</th>
<th>Sexual orientation</th>
<th>Country(s) cited for overseas sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>European</td>
<td>MSM</td>
<td>Japan, Australia</td>
</tr>
<tr>
<td>Male</td>
<td>Maori</td>
<td>MSM</td>
<td>Australia</td>
</tr>
<tr>
<td>Female</td>
<td>European</td>
<td>Heterosexual</td>
<td>Poland</td>
</tr>
<tr>
<td>Male</td>
<td>European</td>
<td>MSM</td>
<td>Australia, USA</td>
</tr>
<tr>
<td>Male</td>
<td>European</td>
<td>MSM</td>
<td>Italy</td>
</tr>
<tr>
<td>Male</td>
<td>Japanese</td>
<td>MSM</td>
<td>Japan</td>
</tr>
<tr>
<td>Male</td>
<td>European</td>
<td>MSM</td>
<td>Malaysia</td>
</tr>
<tr>
<td>Male</td>
<td>European</td>
<td>Heterosexual</td>
<td>Fiji</td>
</tr>
<tr>
<td>Male</td>
<td>Indian</td>
<td>Heterosexual</td>
<td>Fiji</td>
</tr>
<tr>
<td>Male</td>
<td>Fijian</td>
<td>Heterosexual</td>
<td>Fiji</td>
</tr>
<tr>
<td>Male</td>
<td>European</td>
<td>Heterosexual</td>
<td>Thailand</td>
</tr>
<tr>
<td>Male</td>
<td>Latin American</td>
<td>Heterosexual</td>
<td>Chile</td>
</tr>
<tr>
<td>Male</td>
<td>Indian</td>
<td>Heterosexual</td>
<td>Fiji</td>
</tr>
<tr>
<td>Male</td>
<td>Chinese</td>
<td>Heterosexual</td>
<td>China</td>
</tr>
<tr>
<td>Female</td>
<td>Fijian</td>
<td>Heterosexual</td>
<td>Fiji</td>
</tr>
<tr>
<td>Male</td>
<td>Samoan</td>
<td>Heterosexual</td>
<td>Fiji</td>
</tr>
<tr>
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<td>Samoan</td>
<td>Heterosexual</td>
<td>Samoa</td>
</tr>
<tr>
<td>Female</td>
<td>Pacific Islander</td>
<td>Heterosexual</td>
<td>Kiribati</td>
</tr>
<tr>
<td>Male</td>
<td>Indian</td>
<td>Heterosexual</td>
<td>Fiji</td>
</tr>
</tbody>
</table>

*Her partner had sex in Fiji; MSM=men who have sex with men.

Out of the seven cases of infectious syphilis (33.3%) that were identified in heterosexuals without a recent history of sex overseas, three had other possible significant risk factors. One female patient, who was diagnosed on routine antenatal screening, had a male partner from Iraq. One patient was a Japanese male resident in New Zealand who had recently had unprotected sex with a casual female Japanese partner. One heterosexual male was also HIV-positive, so may have had other undisclosed risk factors. By contrast, only six cases in MSM (33.3%) gave a history of recent sex overseas.

There were two cases diagnosed in pregnant women (one mentioned above) on routine antenatal screening, both of whom were asymptomatic and both who had partners with infectious syphilis.

Only four patients in this series had HIV infection: all were male and three of the four were MSM. Three men were already known to have HIV and one was newly diagnosed but had probably acquired his infection some time before the syphilis infection.
Following are three case histories chosen to highlight how easily a diagnosis of syphilis may be missed by a health professional.

**Case 1**
A 22-year-old Maori male presented to ASHS complaining of a lump on his penis for the previous week from which he could express pus. He had had a male sexual partner who was from South America. Examination revealed a large infected cyst on his penile shaft, which was treated with flucloxacillin. His STS were positive with a reactive EIA, reactive TPHA, and an RPR of 1:64, so he was recalled for treatment and partner notification. He had been treated 9 months previously by the Urology Service at Auckland Hospital so his old notes were requested. These confirmed that he had been treated for a paraphimosis. Examination findings at that time also included bilateral firm inguinal lymphadenopathy, which in hindsight was most likely due to early syphilis.

**Case 2**
A 38-year-old European male sex worker (with both male and female clients) presented to ASHS with a 1-month history of fever, sweating and a rash. He had seen his GP recently within the last few days and had been prescribed antihistamines for the rash. On examination, he was noted to have a blotchy maculopapular rash on his trunk and arms with no involvement of his legs, palms or soles. There was no lymphadenopathy and genital examination was normal. He was thought initially to be possibly having an HIV seroconversion illness. HIV serology was negative but STS revealed a reactive EIA, reactive TPHA, and a reactive RPR 1:128. This case illustrates how easily the rash of secondary syphilis may be confused with other diagnoses.

**Case 3**
A 41-year-old European male attended ASHS requesting an HIV test. He had been diagnosed as having pytariasis rosea 5 days earlier by his GP. His only genital symptoms were two red ‘blotches’ on his penis that were visible during erection. He had had a recent sore under his tongue that had been treated as oral candidiasis by his GP and had resolved. He had a regular male partner and disclosed having had unprotected anal and oral sex with a casual male partner 4 months prior to his presentation. Genital examination was unremarkable and there was no lymphadenopathy noted. His oral cavity was normal to inspection. He had a ‘typical pytariasis rosea rash’ noted. A routine sexual health screen was performed and serology for syphilis and HIV was also requested. STS were positive with a reactive EIA, reactive TPHA, and an RPR of 1:64. (Another example of how the rash of secondary syphilis may be easily misdiagnosed.) The lesion under his tongue could possibly have been a chancre. Syphilis may easily be transmitted by orogenital contact.

**Discussion**
Syphilis was once a common disease both in developed and undeveloped countries. By the nineteenth century, syphilis was one of the most common diseases in the United States and Europe, especially in urban areas, where 8%–14% of the population...
had serological evidence of being infected. The advent of effective antibiotic therapy (in the form of penicillin) nearly came close to eradicating the disease in developed nations after the Second World War. As well as dramatically affecting the prevalence of syphilis, antibiotics have altered its clinical presentation and course. The causative organism *Treponema pallidum pallidum*, remains highly susceptible to many antibiotics, therefore late manifestations are seldom seen today.

In New Zealand, the numbers of cases of syphilis have remained low for the last two and a half decades. A national rate was put at 3:100,000 in 1977 and no change in incidence was reported from sexual health clinics between 1986 and 1993. However sentinel surveillance of STD clinic attendees between 1991–1992 found that a history of male-male sex was associated with higher rates of syphilis and gonorrhoea, and lower rates of chlamydia.

Certainly the trend for low incidence rates of infectious syphilis appears to have reversed recently in other Western countries. For example, in the United States and Western Europe, there has been a resurgence in cases of infectious syphilis, particularly among MSM in the previous few years. After declining every year during 1990 to 2000, infectious syphilis rates increased in 2001 in the United States. There was a further 12.4% increase the following year and, as in 2001, the increase was primarily in men. In the United Kingdom, there have also been recent outbreaks of infectious syphilis. Between 1999 and 2000, the number of diagnoses of infectious syphilis in London rose by 41% from 154 cases to 217 cases. The largest rises were seen in MSM.

More locally, in the Pacific region, syphilis appears to be mainly a problem in heterosexuals. Fiji, in particular, is known to have high rates of syphilis infection and is also a common holiday destination for New Zealanders. A study looking at antenatal screening at a maternity unit in Suva in 1987, found that 14.2% of Fijian women and 1.1% of Indian women were seropositive for syphilis.

What does this mean for New Zealand? Certainly there does appear to have been a recent increase in the numbers of people being diagnosed with infectious syphilis at ASHS, with a total of 40 cases between January 2002 and September 2004. These were twice as many cases as were diagnosed in the preceding 4 years (January 1998 to December 2001). (We have also had anecdotal reports from other hospital services that they appear to be seeing more cases of infectious syphilis than is usual. Unfortunately as other hospital services do not participate in STI surveillance this data will not be reported anywhere.)

The fact that MSM comprised 45% of the sample and that the majority acquired their infection in New Zealand suggests that we may be starting to experience a similar trend to Australia and other Western countries. But the disease still appears to be relatively rare in heterosexuals who have not had sex overseas.

What could be contributing to this apparent increase in infectious syphilis in Auckland? The increased rates in MSM could also possibly be related to a reduction in safer sex practices in recent years. Forty five percent of participants in the Gay Auckland Periodic Sex Survey reported never or infrequently using condoms for anal intercourse with regular partners.
Participants were much more likely to report using a condom for anal sex with casual partners than with regular partners, however 5% of men whom had a regular sexual partner also admitted to infrequent condom use with casual sexual partners. There is also some objective evidence of possible increases in unsafe sexual behaviour in MSM with the recent rise in HIV incidence in New Zealand. The number of new cases of HIV diagnosed in 2003 was higher than at any time since surveillance began\textsuperscript{13} with 71 new infections identified - a rise of 37% over 2002.

Men who have sex with men still make up the majority of cases (74%) where infection was acquired in New Zealand. This recent rise in HIV incidence is concerning AIDS epidemiologists. If we are also experiencing a rise in the incidence of infectious syphilis in New Zealand it could influence the HIV epidemic, as syphilis (to a greater degree than other bacterial STI) is known to markedly enhance HIV transmission.

The apparent increase in heterosexual cases may be a reflection of the fact that many New Zealanders now travel overseas to countries with high endemic rates of syphilis. Travellers often have casual sexual relationships when on holiday\textsuperscript{14} and may take risks under the influence of drugs and alcohol. Indeed, overseas travel seems to be responsible for a small but important proportion of acute STIs in other Western countries such as the United Kingdom. For example, in one genitourinary medicine clinic, 21% of infectious syphilis infections in heterosexual men were acquired from sexual contacts abroad\textsuperscript{14}.

The increase in syphilis incidence is a potential serious public health issue and more information is required on its epidemiology in New Zealand. The most expedient manner to gather more information would be to make infectious syphilis a notifiable condition so that anonymous data can be collected in a similar manner to HIV infection.

In particular, medical practitioners need to be aware that syphilis infection is occurring in New Zealand. As well as pregnant women, those who should be screened for syphilis include New Zealanders who have had sex overseas, recent immigrants, and men who have sex with men. Asymptomatic people with these risk factors need to be screened serologically 2–3 months after suspected exposure. Any person suspected of having infectious syphilis should be urgently referred to a sexual health physician for evaluation, treatment, and contact tracing.

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References:


Findings and outcome of teenage women referred for colposcopy at Christchurch Women’s Hospital, New Zealand

Peter Sykes, Dianne Harker, David Peddie

Abstract

Aim To determine the colposcopic findings, treatment, and follow up of 15–19 year old women referred to a large public colposcopy clinic.


Results 243 women or 4.7% of new referrals were aged 15–19 years. Referral smears were high-grade squamous lesions (HGSL) in 15%, and low-grade squamous lesions (LGSL) or atypical squamous cells of uncertain significance (ASCUS) in 82%. Following colposcopy, 21% had biopsy proven high-grade abnormalities but only 4% had grade 3 cervical intraepithelial neoplasia (CIN3). Of those with LGSL or ASCUS smears, 2% had biopsy-proven CIN3; and of those with HGSL smears, 14% had biopsy proven CIN3. Women underwent a mean of 4.1 colposcopy sessions; 67% underwent treatment and 26% were discharged without treatment. Sixteen percent of the women were lost to follow-up. Treatment failure occurred in 8% of those treated. For women undergoing observation, 25% were discharged after the first follow-up and less than 3% progressed to CIN3.

Conclusions The rate of CIN3 in women under the age of 20 referred to colposcopy at Christchurch Women’s Hospital is low. Screening teenage women results in invasive investigation and treatment without proven benefit and is not recommended. A conservative approach to the management of young women with low-grade squamous intraepithelial abnormalities is also advocated.

The goal of the New Zealand National Cervical Screening Programme (NCSP) is to reduce the incidence and mortality rates from cervical cancer among New Zealand women by the early detection and treatment of precancerous cervical abnormalities. Since 1990, women between the ages of 20–69 have been encouraged by the NCSP to have regular cervical smears. Subsequently the incidence and mortality rates of cervical cancer have fallen significantly.¹

Cervical screening is not recommended for women under the age of 20 years, despite this, many practitioners do take smears from women under the age of 20 years. In 1997, the annual number of New Zealand women having cervical smears was 382,578. Of these, 15,834 were from women less than 20 years of age.² Overall, approximately 7.5% of smears taken are reported to have epithelial abnormalities. However, in women under the age of 20 years, this proportion is much higher, ranging from 14% in 1995 to 17% in 2001.²⁻⁴

Overseas literature also identifies a high proportion of smear-detected abnormalities in sexually active women under the age of 20 years. The majority of these represent low-grade abnormalities that are likely to regress spontaneously. However, a
proportion of these are high-grade abnormalities that may be associated with an increased risk of cancer if left untreated.\textsuperscript{5–7} There is some evidence to suggest that high-grade abnormalities in young women are becoming more frequent.\textsuperscript{5–9}

Although the occurrence of high-grade abnormalities in women less than 20 years is disturbing, the occurrence of invasive squamous cervical cancer in women under the age of 30 years is rare.\textsuperscript{10} The psychological trauma related to abnormal smears is well-documented,\textsuperscript{11} but the benefit related to the detection and treatment of abnormalities in teenage women is not.

The time of commencing cervical screening is a controversial issue. In New Zealand, the recommendation is to start screening at age 20 years.\textsuperscript{1} In the United Kingdom, cervical screening commences at 25 years;\textsuperscript{12} in Australia, age 18 is recommended;\textsuperscript{13} and in the United States, women are recommended to begin screening 3 years after becoming sexually active.\textsuperscript{14} In view of the large number of smears taken in teenage women in New Zealand, many smear-takers have practices that differ to NCSP recommendations on this regard.

There is no published New Zealand data on the diagnosis and outcome of women under the age of 20 years with abnormal smears. It is important that such data is available to guide smear-takers and managing clinicians, and to assist in the review of screening recommendations.

The aim of this study, therefore, was to document the referral cytology, histological diagnosis, treatment, and outcome of women under the age of 20 referred to the Colposcopy Clinic at Christchurch Women’s Hospital. The implications of cervical screening in this population and the appropriate management of these young women are of relevance to clinicians and referring practitioners.

**Methods**

This study comprised an audit of the colposcopy database held at Christchurch Women’s Hospital, a large public hospital colposcopy clinic staffed by consultant colposcopists and registrars under supervision. A retrospective review of the colposcopy database records and clinical records for young women age 15–19 years referred to the colposcopy clinic between 1995 and 2001 was undertaken. Referral smear findings, subsequent smear results, and colposcopy and biopsy findings were determined. The study identified what treatment was performed and the short-term outcome of treatment. Compliance with clinical management recommendations was also recorded.

Using the colposcopy database, all women between 15–19 years of age (referred to the Colposcopy Clinic with an Abnormal Smear, from January 1995 to December 2001) were identified. Data on 243 women were abstracted from the pre-existing database into which information had been entered. Clinical records were accessed when data on the database appeared to be incomplete. Relevant information was recorded in an unidentifiable format on a secure database. Descriptive analysis was performed. In consultation with the Canterbury Ethics Committee, the study was considered consistent with a quality assurance activity.

**Results**

Between 1 January 1995 and 31 December 2001, 5167 women were referred to the Colposcopy Clinic at Christchurch Women’s Hospital with abnormal smears; 243 (4.7\%) of these women were aged 15 to 19 years. The age distribution and the number of referrals by year are demonstrated in Table 1. Referrals were more frequent with increasing age. Furthermore, there appears to have been an increase in referrals since 1997.
Table 1. Number of young women, by age, referred for colposcopy at Christchurch Women’s Hospital (1995–2001)

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>1995</th>
<th>1996</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
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<td>3</td>
<td>3</td>
<td>5</td>
<td>9</td>
<td>38</td>
<td>16%</td>
</tr>
<tr>
<td>18</td>
<td>7</td>
<td>4</td>
<td>14</td>
<td>18</td>
<td>8</td>
<td>9</td>
<td>11</td>
<td>71</td>
<td>29%</td>
</tr>
<tr>
<td>19</td>
<td>11</td>
<td>20</td>
<td>13</td>
<td>16</td>
<td>19</td>
<td>21</td>
<td>20</td>
<td>120</td>
<td>49%</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>27</td>
<td>40</td>
<td>38</td>
<td>32</td>
<td>39</td>
<td>42</td>
<td>243</td>
<td>100%</td>
</tr>
</tbody>
</table>

The referral smear correlated by age is seen in Table 2. Of the 243 women under the age of 20 years referred to the Colposcopy Clinic at Christchurch Women’s Hospital, 82% had low-grade abnormalities and 15% had high-grade abnormalities on their referral smear. There was no clear association between the age of the woman and the ratio of high to low grade abnormalities.

Table 2. Referral smear results by age

<table>
<thead>
<tr>
<th>Referral cytology</th>
<th>Age (years)</th>
<th>Total</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>Normal</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Benign Abnormality</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>LGS/ASCUS</td>
<td>2</td>
<td>11</td>
<td>30</td>
</tr>
<tr>
<td>HGSL</td>
<td>1</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Other*</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td>12</td>
<td>38</td>
</tr>
</tbody>
</table>

*This woman was referred following a biopsy proven diagnosis of microinvasive cancer of the cervix; LGS=low grade squamous lesion; ASCUS=atypical cells of uncertain significance; HGSL=high grade squamous lesion.

Histological (biopsy) findings by age at the initial colposcopy are demonstrated in Table 3. At the initial colposcopy visit 185 (76%) women had a biopsy; of these, 8 (4%) had CIN3 and 37 (20%) had CIN2. Glandular abnormalities were not recorded on the database. No cases of invasive carcinoma were identified; but in the study period, one 18-year-old woman was referred to the clinic with a diagnosis of stage 1A1 squamous cell carcinoma of the cervix diagnosed on a large loop excision of the transformation zone (LLETZ) performed outside the hospital clinic.

Fifty-eight women did not undergo biopsy on the first visit, 13 of whom were pregnant. Subsequently, 34 women did have a biopsy performed. The histological findings of these included 8 women with benign abnormalities, 19 women with CIN1 or HPV changes, 6 women with CIN2, and 1 woman with CIN3.

The histological diagnosis (at the first visit in relation to the smear result) is illustrated in Table 4. In women with low-grade smear abnormalities (Atypical squamous cells of uncertain significance [ASCUS], CIN1, human papilloma virus [HPV]), 17% had high-grade histological abnormalities diagnosed on biopsy at their first or subsequent visit of which 2% (4) had CIN3. In women with high-grade smear abnormalities
(CIN2, CIN3), 46% had high-grade histological abnormalities diagnosed on biopsy at their first or subsequent visit of which 14% had CIN3.

Table 3. Biopsy findings at first visit by age

<table>
<thead>
<tr>
<th>Biopsy</th>
<th>Age</th>
<th>Total</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>Normal</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Benign abnormality</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>HPV</td>
<td></td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>CIN1</td>
<td>2</td>
<td>13</td>
<td>32</td>
</tr>
<tr>
<td>CIN2</td>
<td>4</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>CIN3</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Not performed</td>
<td>1</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2</td>
<td>12</td>
<td>38</td>
</tr>
</tbody>
</table>

CIN=cervical intraepithelial neoplasia; HPV=human papilloma virus (changes).

Table 4. Biopsy findings at first visit by referral smear results

<table>
<thead>
<tr>
<th>Referral Smear</th>
<th>Normal</th>
<th>Benign abnormality</th>
<th>HPV</th>
<th>CIN1</th>
<th>CIN2 (No biopsy)</th>
<th>Pregnant</th>
<th>Not performed</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>6</td>
<td>16</td>
<td>1</td>
<td>102</td>
<td>31</td>
<td>1</td>
<td>1</td>
<td>201</td>
</tr>
<tr>
<td>Benign abnormality</td>
<td>1</td>
<td>17</td>
<td>14</td>
<td>2</td>
<td>1</td>
<td>35</td>
<td>1</td>
<td>37</td>
</tr>
<tr>
<td>LGSL/ASCUS</td>
<td>1</td>
<td>16</td>
<td>102</td>
<td>31</td>
<td>11</td>
<td>35</td>
<td>1</td>
<td>201</td>
</tr>
<tr>
<td>HGSL</td>
<td>1</td>
<td>16</td>
<td>14</td>
<td>2</td>
<td>1</td>
<td>35</td>
<td>1</td>
<td>37</td>
</tr>
<tr>
<td>Other*</td>
<td>7</td>
<td>16</td>
<td>117</td>
<td>45</td>
<td>13</td>
<td>1</td>
<td>1</td>
<td>45</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>7</td>
<td>16</td>
<td>117</td>
<td>45</td>
<td>13</td>
<td>1</td>
<td>1</td>
<td>243</td>
</tr>
</tbody>
</table>

CIN=cervical intraepithelial neoplasia; HPV=human papilloma virus (changes); LGSL=low grade squamous lesion; ASCUS=atypical squamous cells of uncertain significance; HGSL=high grade squamous lesion.

The 243 young women (referred for colposcopy) underwent a mean of 4.1 colposcopy episodes including treatment. In total, 67% (162/243) had treatment and 26% (64/243) were discharged without treatment. All women attended for the initial follow-up colposcopy or treatment, but 16% (39/243) of women were lost to follow-up before being referred back to the smear taker.

After the initial colposcopy, 51% (123/243) of women were referred for treatment, follow-up was recommended for 48% (117/243), and 3 women were referred back to the smear taker. Of the 123 referred for treatment, 115 received this treatment, 2 were lost to follow-up, and 6 resolved prior to treatment.

Of the 117 women who were referred for follow-up colposcopy, 39 (33%) were referred for treatment, 49 (42%) underwent further follow-up, and 29 (25%) were referred back to the smear-taker. Of the 49 having further follow-up, 8 had treatment, 26 were discharged, 3 are under continued surveillance, and 12 were lost to follow-up. Progression to CIN3 occurred in 3 out of 117 women undergoing conservative management.
Of the 162 women undergoing treatment, 33% had a histological diagnosis of a high grade squamous lesion (HGSL) and 57% a low grade squamous lesion (LGSL) prior to their treatment. Women with a biopsy-proven high-grade abnormality after initial colposcopy were referred for treatment in 91% of cases. Women with a biopsy-proven low-grade abnormality after initial colposcopy were referred for treatment in 43% of cases. Treatments included laser ablation 29%, LLETZ 36%, diathermy ablation 25%, Cartier loop biopsy 6%, and cone biopsy 4%. Treatment failure requiring further treatment occurred in 8% (13/162) women who received treatment.

**Discussion**

This paper documents the findings and early outcome of women under the age of 20 referred to a large public hospital colposcopy clinic in New Zealand. In total, only 4% (9/243) of women had CIN3, but 18% (43/243) had CIN2. This spectrum of disease is similar to that described in other populations of this age group although rates of CIN3 do vary in these studies.\(^{15-20}\)

In our population, however, rates of CIN3 do appear to differ from our normal colposcopy population. In 2001, of the total referrals to our colposcopy clinic with abnormal cytology, 21% of women had biopsy-proven CIN3 and 21% had CIN 2. These statistics appear consistent with the hypothesis that teenage women have a high incidence of low-grade cytological abnormalities in association with transient human papilloma virus (HPV) infection, and that CIN3 is rare.\(^{21}\)

Despite the low-grade nature of disease in most of these women, 67% (162/243) underwent treatment, only 26% (64/243) were discharged to the smear-taker without treatment. After the first visit, 43% of those women with low-grade abnormalities were treated. The reasons for this high rate of treatment is unclear and beyond the scope of this study. Women were managed on an individual basis by consultant colposcopists without the use of formal protocols. One possible reason for the high treatment rates might have been the expectation of a high loss to follow-up rate. In this study, 16% (39/243) of women were lost to follow-up. It was noted, however, that while all women attended for early treatment or their initial follow-up visit, prolonged colposcopy follow-up was associated with a high (24%) loss to follow-up rate. Treatment was, however, associated with a low failure rate (8%).

In those women referred for follow up without treatment, 25% (29/117) of abnormalities had resolved and the women were discharged after the first follow up examination which occurred at 6–12 months following the initial colposcopy. Progression to CIN3 was seen in only 2.6% of the women. Syrjanen reported resolution rates of 56% for CINI and 53% for CIN2;\(^{22}\) other authors report similar rates at two years,\(^{23,24}\) and there is evidence to suggest higher rates of resolution in younger women.\(^{21,25}\) It would therefore appear that with a more conservative approach, more women could have safely avoided treatment.

In the period of the study, these teenage women made up approximately 5% of the new patient load. It is interesting to note that approximately 4% of smears are taken in this age group,\(^3\) so teenage women may be referred at similar rates to the rest of the population despite higher documented abnormality rates. Approximately 50% of women in the study were age 19 years and 29% were age 18 years at their first
colposcopy. This leads us to believe that widespread screening is not being undertaken in women under age 18 years.

The reasons cited by practitioners for screening of teenage women include:

- The lower recommended screening ages in other programs,
- Encouragement of screening behaviour,
- Concern that teenage women who have been sexually active for several years may be at high risk of early onset cancer, and
- Anecdotes of teenage women with CIN3 or invasive cancer.

Despite the occurrence of one micro invasive carcinoma in this time period, it is clear that cervical cancer is exceedingly rare in women under the age of 30 years. In New Zealand in 2002, only 5.5% of cervical cancers occurred in women under the age of 30, and none under the age of 20. The benefit, therefore, of screening in women under 20 is minimal at best. In a recent large case control study in the United Kingdom, smears under the age of 25 conferred no significant protective effect against cervical cancer. The authors of that paper recommended that screening be deferred until the age of 25.

The negative psychological impact of abnormal cervical cytology has been documented. Up to 17% of young women in this age group have abnormal cytology in smears. The young women in this series underwent a mean of 4.1 colposcopy episodes, and the majority underwent treatment. Although the numbers are relatively small, the burden of this intervention to both the young women and health services is significant.

A recent literature review identified an increased risk of premature delivery in women who have undergone LLETZ treatment. It must be considered whether the act of taking smears in women of this age group may actually do harm. Screening on the basis of lifestyle factors offers poor predictive value for high-grade abnormalities. We therefore do not advocate screening in this age group. If a smear has been taken and is abnormal what should be done? Most practitioners manage these young women in the same way as women of other age groups but is this justified?

In this study, women with a LGSL or ASCUS smear had a 2% risk of CIN3 and a 14% risk of CIN2 pathology. This compares to a 7% risk of CIN3 and a 12% risk of CIN2 pathology in our total colposcopy population with LGSL or ASCUS cytology. The low risk of CIN3 in teenage women raises the question; can colposcopy be justified on the basis of low-grade smears? The risk of progression to malignancy is very low, even in the normal population with low-grade cytological abnormalities without cytological progression. A longer period of cytological surveillance in these young women may reduce requirements for colposcopy without appreciable risk to women. HGSL smears were less frequent and 46% of these women had high-grade pathological abnormalities; 14% having CIN 3. Although the benefit of treatment in this young age group remains unproven, the referral of women with high-grade smears to colposcopy is more easily justified.

What should be done for young women who are referred to colposcopy? In view of the high rates of LGSL, the unproven benefit of screening in this age group and the potential harm of treatment, the authors advocate observation rather than treatment in
teenage women with LGSL pathology. This is in agreement with the American Society for Colposcopy and Cervical Pathology (ASCCP) consensus guidelines. The use of written protocols within clinics may assist in this process. In view of the low progression rates and high loss to follow-up after prolonged follow-up colposcopy, cytology follow-up may again be preferable. In view of the rare occurrence of malignancy in young women, CIN3 is probably best treated, but as suggested by ASCCP, the initial observation of CIN2 lesions may be considered.

However, the observations of increasing rates of HGSL smears in women aged 20–25 years, and the occasional occurrence of invasive cancer in very young women, are concerning. Trends in the incidence of cancer and preinvasive disease in young women should continue to be monitored.

In conclusion, the rate of CIN3 in women under the age of 20 years referred to colposcopy at Christchurch Women’s Hospital is low. Screening teenage women results in invasive investigation and treatment without proven benefit and is not recommended. A conservative approach to the management of young women with low-grade squamous intraepithelial abnormalities is advocated.

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Acknowledgment: We thank the Canterbury District Health Board for the funding grant to enable this audit to be conducted.

Correspondence: Dr Peter Sykes, Department of Obstetrics and Gynaecology, Christchurch Women’s Hospital, Private Bag 4711, Christchurch. Fax: (03) 364 4634; email: peter.sykes@chmeds.ac.nz

References:

The utility of blood cultures in the management of non-facial cellulitis appears to be low

Anna Stevenson, Phil Hider, Martin Than

Abstract

**Aim** To assess the utility of blood cultures in the management of patients presenting to the Emergency Department at Christchurch Hospital from the community with non-facial cellulitis (or soft tissue infection) and no other morbidity.

**Methods** A multidisciplinary team formulated the search protocol. A systematic review methodology was used. Seven electronic databases were searched for clinical studies of blood culture utility in patients with non-facial cellulitis. Relevant studies were appraised using predetermined validity assessment criteria. Conclusions were presented based on an assessment of the validity and applicability of the evidence.

**Results** Seventeen studies were identified as addressing the topic at least as part of a secondary objective for the study. All were retrospective reviews or case series and were often associated with significant methodological limitations.

**Conclusions** Blood cultures are rarely positive in patients presenting from the community with non-facial cellulitis. When they are positive, initial empiric therapy is usually adequate to treat pathogenic bacteria. The available evidence does not support the routine use of blood cultures in the clinical management of healthy adults presenting with non-facial cellulitis at the Emergency Department.

Our study aimed to assess the utility of blood cultures in the management of patients presenting from the community to the Emergency Department/Acute Assessment Area with non-facial cellulitis.

Blood cultures are part of the standard diagnostic workup for many infectious diseases. They are reported as positive or negative. A positive blood culture may indicate that the patient is bacteraemic or that contamination has occurred at some point in the test. A negative result suggests that the patient was not bacteraemic at the time the culture was taken or that the culture was not performed appropriately. Ideally contamination rates should not exceed 3%.

Guidelines for patients presenting to the Emergency Department (ED) at Christchurch Hospital with a provisional diagnosis of cellulitis include blood cultures as part of the usual diagnostic workup. Approximately 600 patients are admitted each year to Christchurch Hospital with a primary diagnosis of cellulitis. The direct laboratory costs associated with blood cultures in these patients is approximately NZ$20,000.

The Clinical Decision Support Unit (CDSU) was recently formed by the Christchurch School of Medicine and Health Sciences and the Canterbury District Health Board (CDHB) to provide clinical staff with evidence based information to support clinical decision-making. The CDSU assessed the utility of blood cultures in the management of cellulitis using a systematic review methodology.
Methods

A multidisciplinary team, which included representatives from the Departments of Infectious Diseases, Microbiology, Emergency, and General Medicine; the Christchurch Medical Library; and members of the CDSU, met to formulate a search protocol using a standardised format.2

The review aimed to answer the question: Do the results of blood cultures (positive or negative) have any impact on the clinical management of patients presenting to the hospital with a suspected diagnosis of cellulitis/soft tissue infection? Particular outcomes included length of hospital stay, choice and duration of antibiotic treatment, complications of cellulitis, and morbidity.

The following databases were searched: Medline 1966–October 2003, Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, Embase 1988-October 2003, PubMed, International Pharmaceutical Abstracts, Best Evidence-ACP Journal Club. Relevant internet sites and professional organisation websites were searched and reference lists from selected articles were examined. Expert opinion articles were assessed.

The search was carried out by library staff and the results reviewed by the CDSU team. The search question was narrowed to focus on healthy adult patients with cellulitis, excluding facial cellulitis. It was assumed that patients presenting with cellulitis who were known or suspected to be immunocompromised or had prosthetic implants or who presented with an unusual clinical history would continue to have blood cultures taken. Reports with less than 10 subjects and non-English language studies were excluded.

Most of the studies were appraised using Validity Assessment Criteria which have been developed for use with case series. The following predetermined criteria were used:

- Was the study conducted prospectively?
- Was the method of selection of cases identified and appropriate?
- Was the duration and completeness of follow-up reported and was it adequate?

Each criterion was graded as ‘ideal’, ‘acceptable’ or ‘unacceptable’ according to specified guidelines.3

Results

237 abstracts and approximately 100 internet sites were reviewed. In total, 120 papers were assessed against the inclusion criteria.

Only seventeen trials were included in the review. All were retrospective reviews or case series studies, (Grade 4 on the ‘evidence pyramid’4) and were generally not well designed or clearly reported. Only one paper met all of the quality criteria but it did not directly assess our review question.

The studies involved diverse settings and populations including an urban emergency department (ED) in the USA servicing a population with a high percentage of drug abusers in the 1980s,6 an infectious diseases department in Sweden,5 and an Australian ED in the 1990s.7 (See Table 1.)

Only five studies6,8–11 assessed our review question as part of their main objective. The study with the largest sample (n=757 was a retrospective review of patients admitted to an Israeli hospital with cellulitis. The authors reported that only 2% of cultures were found to be positive and these did not result in significant changes in management for any of the 11 patients involved.11
### Table 1. Included studies

<table>
<thead>
<tr>
<th>Sample and setting</th>
<th>What was the aim of the study?</th>
<th>Methodology and Reporting (See validity assessment criteria(3))</th>
<th>Did taking cultures affect patient management?</th>
<th>Authors conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical record review of 757 patients with cellulitis treated over a 41 month period at an urban hospital, Jerusalem, Israel Perl 1999(1)</td>
<td>To develop an evidence based guideline for blood culture ordering in patients with cellulitis</td>
<td>No</td>
<td>Ideal</td>
<td>Ideal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11/553 cultures positive (2%)</td>
</tr>
<tr>
<td>Clinical record review of 20 patients with cellulitis from a group of 250 cases treated over a 20 month period in a university hospital, New York, USA. Goldgeier 1983(6)</td>
<td>To assess the utility of needle aspiration and blood cultures in cellulitis patients</td>
<td>No</td>
<td>Accept</td>
<td>Ideal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6/40 cultures positive. (15%) 2 from an infant, 2 from an immunocompromised patient and 2 contaminants.</td>
</tr>
<tr>
<td>Clinical record review of 110 cases of cellulitis treated over a five year period in a community hospital in Honolulu, Hawaii. Ho 1979(8)</td>
<td>To examine the utility of blood cultures in patients with cellulitis</td>
<td>No</td>
<td>Accept</td>
<td>Ideal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1/130 cultures positive (0.77%) 66 patients- 32 of these had received antibiotics in the preceding 24 hours</td>
</tr>
<tr>
<td>50 cases of cellulitis (?time period) treated at Harbourview Medical Centre ED, Seattle USA. Hook 1986(9)</td>
<td>To examine the utility of blood cultures, needle aspirates, wound swabs and punch biopsies.</td>
<td>Yes</td>
<td>Accept</td>
<td>Ideal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2/50 patients had positive blood cultures (4%)</td>
</tr>
<tr>
<td>Table 1. Included studies continued</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>-----------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Clinical record review of 24 cases of acute cellulitis treated (time period) at a university hospital, Missouri, USA. Liles 1985 (10)</strong></td>
<td>To compare the utility of needle aspiration and blood cultures</td>
<td>No</td>
<td>Accept</td>
<td>Ideal</td>
</tr>
<tr>
<td>1/21 patients had a positive blood culture (4.8%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Studies assessing general blood culture utility</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Clinical record review of 1062 blood cultures taken over a nine month period in an urban teaching hospitals emergency department, Footscray, Australia. Kelly 1998 (12)</strong></td>
<td>To develop an evidence based guideline for blood culture ordering in an ED.</td>
<td>No</td>
<td>Ideal</td>
<td>Ideal</td>
</tr>
<tr>
<td>2% of cultures taken off cellulitis patients were true positives with no effect on patient management.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Clinical record review of 730 blood cultures from 718 patients taken over a three month period at a university hospital, Jerusalem, Israel, Stalnikowicz 2001 (13)</strong></td>
<td>To evaluate the utility of blood cultures taken in the ED environment</td>
<td>No</td>
<td>Ideal</td>
<td>Ideal</td>
</tr>
<tr>
<td>71/730 cultures positive (9.7%). 47 of these contaminated (6.3%).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2/82 (2.4%) cultures positive in cellulitis patients.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study Description</td>
<td>Objective</td>
<td>Conclusion</td>
<td>Blood Cultures Findings</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Clinical record review of 139 patients with cellulitis in a tertiary teaching hospital in Melbourne, Australia. Aly 1996</td>
<td>To identify inefficiencies in clinical management and design guidelines</td>
<td>No, Accept, Ideal, No</td>
<td>0/65 cultures positive</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Blood cultures in cellulitis “almost always negative and therefore pointless”</td>
<td></td>
</tr>
<tr>
<td>Clinical record review of 416 cases of cellulitis treated over one year at five Canadian urban emergency departments. Dong 2001</td>
<td>To determine practice variation amongst five EDs</td>
<td>No, Ideal, Ideal</td>
<td>Not enough information</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4/44 blood cultures were positive (9.1%). (personal communication).</td>
<td></td>
</tr>
<tr>
<td>Clinical record review of 365 patients with erysipelas treated over three years in a university hospital, Tel Aviv, Israel. Bishara 2001</td>
<td>Identify patterns of antibiotic use</td>
<td>No, Ideal, Ideal</td>
<td>1/176 patients</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6/176 blood cultures positive (3.4%)</td>
<td></td>
</tr>
<tr>
<td>Clinical record review of 306 patients (332 cases) with cellulitis treated over six years in a university hospital, Barcelona, Spain. Carratala 2003</td>
<td>To examine medical outcomes of hospitalized patients with cellulitis</td>
<td>No, Ideal, Ideal</td>
<td>Yes, in patients with co-morbidities.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>47/251 blood cultures positive (18.73%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Patients with co-morbid conditions, obesity and congestive heart failure were at increased risk of death.</td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>Participants</td>
<td>Objective</td>
<td>Data Collection</td>
<td>Blood Cultures</td>
</tr>
<tr>
<td>-------</td>
<td>--------------</td>
<td>-----------</td>
<td>----------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Ginsberg 1981</td>
<td>Clinical record review of 101 patients with cellulitis treated over six months in a teaching hospital, Boston, USA.</td>
<td>To collect demographic data on cellulitis patients</td>
<td>No</td>
<td>Accept</td>
</tr>
<tr>
<td></td>
<td>0/27 blood cultures positive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jorup-Ronstrum 1986</td>
<td>233 patients with erysipelas admitted to an infectious diseases department over two years at Danderyd Hospital, Sweden.</td>
<td>To describe the demographics of erysipelas</td>
<td>Yes</td>
<td>Ideal</td>
</tr>
<tr>
<td></td>
<td>12/149 blood cultures positive (8.05%). (30 cultures taken from pre-treated patients)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lutomski 1988</td>
<td>25 patients with cellulitis treated at a university hospital, Ohio, USA.</td>
<td>To describe the causative organisms of cellulitis</td>
<td>Yes</td>
<td>Accept</td>
</tr>
<tr>
<td></td>
<td>4/25 patients had a positive blood culture (16%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Newell 1988</td>
<td>30 patients with cellulitis treated at a university hospital, Pennsylvania, USA.</td>
<td>To establish the best site for performing needle aspiration</td>
<td>Yes</td>
<td>Accept</td>
</tr>
<tr>
<td></td>
<td>1/26 blood cultures positive (3.8%) (immuno-compromised patient)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sachs 1990</td>
<td>25 patients with cellulitis treated at a university hospital Philadelphia, USA.</td>
<td>To determine clinical features associated with positive needle aspiration</td>
<td>Yes</td>
<td>Accept</td>
</tr>
<tr>
<td></td>
<td>1/50 blood cultures positive (2%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The deficiencies of a retrospective record review were recognised by the authors and the potential limitations noted were:

- A reliance on patient records
- Inability to exclude the possibility of missing some relevant patients
- Inability to exclude the possibility that some patients were pre-treated with antimicrobials
- 27% of the relevant patients did not have blood cultures taken for an undetermined reason.

Two other studies assessed the broader topic of blood culture ordering in EDs in Australia\(^\text{12}\) and Israel.\(^\text{13}\) Both were retrospective reviews but were otherwise methodologically sound and well reported. Both papers had consistent results with positive culture rates of 5%\(^\text{12}\) and 3.3%\(^\text{12,13}\) and contamination rates of 4%\(^\text{12}\) and 6.3%.\(^\text{13}\) Among the cultures taken from patients with cellulitis only one resulted in any change in management and it was noted that the patient was immunocompromised.\(^\text{13}\)

Two papers examined the general management of cellulitis and both concluded that practice variation was surprisingly and unnecessarily large. Aly concluded blood cultures were ‘pointless’\(^\text{14}\) and Rowe noted ‘(physicians) judge the patients clinically, and so we have largely eliminated (blood cultures).’ (Rowe, personal communication, 2004; see\(^\text{15}\))

None of the remaining papers provided sufficient detail about baseline clinical management to assess the impact of the results from the blood culture tests.

**Discussion**

Although blood cultures are a well-established part of the diagnostic work-up for patients with cellulitis, strong evidence to support their routine use in healthy patients with cellulitis was not found.

Although the overall quality of the papers was low there were several consistent results:

- Blood cultures are rarely positive in the healthy adult
- When positive they rarely result in significant clinical changes
- Contamination rates are very high
- It is difficult to predict bacteraemia on clinical grounds alone

Currently blood cultures are the only method available to clinicians to definitively diagnose and treat bacteraemia. There is a considerable research base regarding how to perform a blood culture in such a way as to optimise true positive rates and decrease contamination rates.\(^\text{16,17}\)

The diagnosis of bacteraemia is optimised when:

- The cultures are taken at the right time (as close to fever peak as possible)
- An adequate amount of blood is drawn (20 ml)
Two separate cultures are taken by separate venepuncture

Attention is paid to aseptic technique.

Contaminated cultures may incur additional costs such as increased length of stay, unnecessary antibiotic therapy and extra testing and monitoring. Bates et al\textsuperscript{18} estimated that contaminant blood cultures were correlated with 20\% and 39\% increases in laboratory charges and intravenous antibiotic charges respectively. Surdelescu et al\textsuperscript{19,20} compared patients with negative cultures to those with contaminated cultures and estimated that each contaminated culture cost the hospital an extra US$6302 in patient care costs.

Other investigators have researched ways of improving how blood cultures are taken and promising methods include feedback to culture takers,\textsuperscript{20} providing training in aseptic technique,\textsuperscript{1} stocking wards with blood culture ‘kits’,\textsuperscript{1} developing algorithms which would enable clinicians to predict which patients are more likely to be bacteraemic,\textsuperscript{21–24} and having dedicated blood culture phlebotomy teams.\textsuperscript{1,19} Further research into these factors is planned at Christchurch Hospital.

**Conclusions**

Published rates of blood culture contamination are relatively high whereas true positive rates appear to be low. When blood cultures are positive initial empiric therapy is usually adequate to treat the pathogenic bacteria. An extensive literature search was not able to produce any high quality evidence to support the routine use of blood cultures in the clinical management of healthy adults presenting with cellulitis at the ED.

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**Acknowledgements** We thank Carol Davison and Rebecca Phibbs at the Christchurch Medical Library for their patient and dedicated searching assistance. The CDSU is grateful for funding from the Canterbury District Health Board.

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**References:**


Demographic variation in the use of antibiotics in a New Zealand town

Pauline Norris, Gordon Becket, Denise Ecke

Abstract

**Aims** To describe the use of antibiotics in one New Zealand town, and to investigate relationships between antibiotic use and gender, age, and socioeconomic status.

**Methods** Data from dispensing computers in all community pharmacies in the town were extracted. All dispensings of antibiotics to residents in the town were identified. Discrete individuals were identified and, where possible, linked with data on gender, age and the socioeconomic status (NZDep) of the area in which they lived.

**Results** 42% of residents in the town received one or more dispensing of antibiotics in 2002. These people, on average, received 2.1 dispensings. Children received antibiotics more often than adults, females more than males and there was a strong relationship between socioeconomic status and antibiotic dispensings.

**Conclusions** Rates of antibiotic use in the community are strongly influenced by age, gender and socioeconomic status.

Antibiotic resistance is an increasing problem, that has received considerable attention both internationally\(^1,2\) and in New Zealand.\(^3\) Antibiotics are extensively used in animals\(^4\) and there is concern that this practice promotes resistance in bacteria which can be transferred to humans.\(^1\) However it has been estimated that 50% of antibiotics use is by humans, of which 80% is outside hospitals, and 20–50% of this is unnecessary.\(^5\)

Resistance develops wherever antibiotics are used, whether this use is appropriate or inappropriate, but inappropriate use increases resistance without giving benefits to patients.\(^3\) The WHO argues that while total consumption of antibiotics is likely to be the critical factor in selecting resistance, under-use through inadequate dosing, and poor adherence by patients may also be important.\(^2\)

New Zealand research has consistently shown high levels of inappropriate prescribing,\(^6,7\) although consumption of some antibiotics is clearly dropping.\(^8\) However little is known about the extent of antibiotic use at a community level, and how this varies with socioeconomic status.

Potential data sources on drug use in New Zealand include Pharmhouse (the data warehouse of all subsidised prescriptions), general practice databases, manufacturers or wholesalers, and community pharmacy dispensing databases. Pharmhouse includes all prescriptions filled and subsidised, rather than all prescriptions written (i.e. prescriptions not collected are not included). Unsubsidised prescriptions (for which no subsidy is available [e.g. sildenafil] or for which the prescription price is lower than the patient copayment) are not included, and the number of subsidised prescriptions cannot be estimated with any precision.
No unique patient identifiers are included in Pharmhouse, so the number of discrete individuals who received particular drugs cannot be estimated. Few patient characteristics are included.

General practice databases include prescriptions written. Thus prescriptions which are not picked up from a pharmacy and prescriptions which may not have been intended to be picked up (ie delayed prescriptions) are included. Unsubsidised drugs are included. However any one general practice can only provide data about drugs prescribed to its patients, and they may also visit other practices. Data can be combined from various practices but this is complicated by different computer systems.

Data from manufacturers and wholesalers can potentially give an overall picture of drug consumption, but includes medicines stockpiled in pharmacies and warehouses. The number of patients treated with each drug cannot be determined.

Community pharmacy dispensing computers can provide data on all drugs dispensed. This is not necessarily equivalent to drugs consumed, because people may or may not take their medicines, but it provides a better proxy for actual consumption levels than prescribing does. Pharmacies, like general practices, can only provide data about their own clients, but combining datasets from multiple pharmacies is much easier because there are only two major dispensing programmes. In a small town it is feasible to combine data from all pharmacies; and if the town is isolated, this should provide an almost complete picture of drugs dispensed in the town.

Geographical Information Systems (GIS) technology provides a way to map patient addresses to small geographical units (geocoding). This can then be linked to demographic data (from the New Zealand census) about the population in those units. Previous work has shown that GIS technology can be used to analyse data from community pharmacy prescription databases.

Methods

In this study, we obtained data on all prescriptions dispensed from the small number of pharmacies in the study town, combined the databases, matched patient names and addresses to identify individual patients, geocoded the data and matched it with NZDep 2001 data.

Ethical approval for the study was given by the relevant Regional Ethics Committee, subject to strict procedures for protecting patient confidentiality. In addition, the identity of the town was not to be revealed.

The town was chosen because it is more than 1 hour drive from any other town with a pharmacy (so we assume that almost all prescriptions for inhabitants will be dispensed in the town), it has a small number of pharmacies (therefore gaining consent from the pharmacists, and combining databases was feasible), it had more than two pharmacies (therefore any information produced did not allow any one pharmacist to deduce commercially sensitive information about another), it had a big enough population, enough meshblocks (smallest geographical area for which data is available) and enough variation in socioeconomic status (measured by NZDep2001) to allow meaningful analysis.

Consent was gained from the community pharmacy owners in the town. We aimed to download all dispensings of all prescriptions from each of the pharmacies in 2002. In some computer systems this was impossible, so data from a longer period was downloaded. Using Microsoft Access software, data on dispensings of antibiotics (chemical entities and brand names identified as such in New Ethicals or the Pharmaceutical Schedule) for the 1 Jan–31 Dec 2002 was extracted and combined. This produced a list of all dispensing of antibiotics in the town during the year.

Dispensings to people who did not live in the town or whose addresses were non-geocodable were excluded. These were addresses in other towns or countries, rural delivery addresses, PO Box numbers.
and unusual addresses which could not be interpreted (such as ‘Quarry’). Addresses were cleaned to allow geocoding (e.g. making sure the address was in the right column, standardising the format). The data was then examined line by line and discrete individuals were identified and given an ID number.

Addresses were geocoded using ArcGIS™ software. This produced a map of the town showing the addresses of all patients who received antibiotic prescriptions, in meshblocks. Tables were created of numbers of dispensings for each meshblock. Population numbers for each meshblock were obtained from the Statistics New Zealand website (www.stats.govt.nz) (final counts for 2001 Census of Population and Dwellings). NZDep2001 scores (a score of socioeconomic deprivation derived from Census data) were obtained from the Ministry of Health website (www.moh.govt.nz/phi/publications). We used deciles rather than raw NZDep scores.

The prescription databases contained some information about patients’ age and gender, but this was not available for all patients. Most records gave date of birth (7819 records). We defined a child as someone whose date of birth was 31 Dec 1983 or later (19 years old at the beginning of 2002). Nineteen was chosen to match available statistical data on age. Where this was not available we classified as a child anyone who had ‘Master’ as a title, or who had a prescription code ‘Y’, or ‘J’. Adults were people who had a date of birth earlier than 31/12/83 or who had a prescription code ‘A’, or ‘PS’ (pensioner). In most cases gender could be determined by the codes ‘M’ and “F” in the database. Where this was not available, titles (such as Mr, Mrs), where available, were used to determine gender.

Microsoft Excel software was used to calculate regression equations for the relationship between NZDep (in deciles) and antibiotic dispensings.

Results

In total, 691,867 records were extracted. There were 264,261 dispensings in the 2002 year. Of these, 15,155 were dispensings of antibiotics (5.7%).

We excluded 1392 antibiotic dispensings because they were for people whose addresses were outside of the town (i.e. in other towns or cities or overseas), 2426 because they were rural addresses, and 99 because they were obviously ungeocodable for other reasons. Thus, in total 3917 records were excluded (25.8%). During geocoding we found another 114 records which could not be geocoded.

There were 11,238 dispensings of antibiotics to inhabitants of the town in 2002. These were dispensed to 5357 discrete individuals. This is 42.2% of the people living in the town. The average number of dispensings for people who received a prescription was 2.1.

The most commonly dispensed drugs were amoxycillin (3225, 28.7% of total dispensings) and amoxycillin with clavulanic acid (2058, 18.3%). The next most commonly dispensed drugs were flucloxicillin (828, 7.4%) and erythromycin (791, 7.0%) (Table 1).

There were 3170 dispensings in which we could not work out whether the recipient was a child or an adult. Of the remaining 8068 dispensings, 3064 (38.0%) were for children and 5004 (62.0%) were for adults. In the town as a whole, 25.5% of the population are under the age of 19 (i.e. our definition of a child). Therefore, on average, children received more prescriptions, than adults.

We looked at the number of discrete individual children and adults who had been dispensed antibiotics during 2002. This was 1469 children and 2169 adults (Table 2). Because we could not classify the recipients of 3170 dispensings, we cannot reliably calculate the percentage of the child and adult population who received antibiotics. Those who we could classify represent 45.3% of the child population, and 22.9% of the adult population.
Table 1. Drugs dispensed

<table>
<thead>
<tr>
<th>Chemical entities</th>
<th>Number of dispensings</th>
<th>Percentage of total dispensings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoxycillin</td>
<td>3225</td>
<td>28.7</td>
</tr>
<tr>
<td>Amoxycillin/Clavulanic Acid</td>
<td>2058</td>
<td>18.3</td>
</tr>
<tr>
<td>Flucloxacillin</td>
<td>828</td>
<td>7.4</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>791</td>
<td>7.0</td>
</tr>
<tr>
<td>Doxycycline</td>
<td>609</td>
<td>5.4</td>
</tr>
<tr>
<td>Norfloxacin</td>
<td>514</td>
<td>4.6</td>
</tr>
<tr>
<td>Trimethoprim</td>
<td>495</td>
<td>4.4</td>
</tr>
<tr>
<td>Cefaclor</td>
<td>417</td>
<td>3.7</td>
</tr>
<tr>
<td>Penicillin V</td>
<td>385</td>
<td>3.4</td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>379</td>
<td>3.4</td>
</tr>
<tr>
<td>Co-trimoxazole</td>
<td>324</td>
<td>2.9</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>238</td>
<td>2.1</td>
</tr>
<tr>
<td>Fusidic Acid</td>
<td>230</td>
<td>2.0</td>
</tr>
<tr>
<td>Nitrofurantoin</td>
<td>220</td>
<td>1.9</td>
</tr>
<tr>
<td>Minocycline</td>
<td>187</td>
<td>1.7</td>
</tr>
<tr>
<td>Roxithromycin</td>
<td>154</td>
<td>1.4</td>
</tr>
<tr>
<td>Dicloxacillin</td>
<td>130</td>
<td>1.1</td>
</tr>
</tbody>
</table>

There were 1347 dispensings in which we could not work out whether the recipient was male or female. Of the remaining 9891 dispensings, 6127 (61.9%) were for females and 3764 (38.1%) were for males (Table 2). In the town as a whole, 52.4% of the population are female. Therefore on average females received far more prescriptions than males. Excluding the 1347 dispensings which we cannot classify, on average females received 0.92 antibiotic prescriptions in 2002, while males received 0.62 antibiotic prescriptions.

Table 2. Dispensings to adults and children (males and females)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total population</th>
<th>Number of dispensings</th>
<th>Number of discrete individuals who received prescriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children*</td>
<td>3243</td>
<td>3064</td>
<td>1469</td>
</tr>
<tr>
<td>Adults</td>
<td>9453</td>
<td>5049</td>
<td>2169</td>
</tr>
<tr>
<td>Males*</td>
<td>6048</td>
<td>3764</td>
<td>1958</td>
</tr>
<tr>
<td>Females</td>
<td>6645</td>
<td>6127</td>
<td>2842</td>
</tr>
</tbody>
</table>

*Recipients of 3170 dispensings could not be classified as either children or adult; 9Recipients of 1347 dispensings could not be classified as either female or male.

We looked at the number of discrete individual females and adults who received prescriptions for antibiotics during 2002. This was 2842 females and 1958 males. Because we could not classify the recipients of 1347 dispensings we cannot reliably calculate the percentage of the male and female population who received antibiotics. Those who we could classify represent 32.4% of the male population, and 42.8% of the female population.
We calculated the number of dispensings per person in meshblocks of differing NZDep levels (Figure 1). The number of people living in each decile ranged from 426 in the most deprived area to 2145 in the seventh decile. In the least deprived areas the average number of dispensings per person was about 0.5. Those rose reasonably consistently as NZDep score increased. In the most deprived areas, the average number of dispensings per person was approximately 1.0.

Figure 1. Antibiotic use for total population by New Zealand Index of Deprivation deciles

![Antibiotic consumption total vs NZDep decile](image)

For this graph \( y = 0.0063x + 0.4665 \). \( R^2 = 0.84 \).

We then looked at the relationship between NZDep and antibiotic dispensings for children (Figure 2). Numbers of children per decile ranged from 96 in the most deprived decile to 573 in the seventh decile. Children in the least deprived areas received about 0.5 dispensings in 2002. The slope of this graph was steeper than that for the adults. Children in the most deprived areas received 1.3 prescriptions during the year. These are conservative estimates of the number of prescriptions per child, because of the number of prescriptions (3170) which we were unable to assign to either adults or children.
Discussion

Twenty-six percent of the antibiotic dispensings recorded in pharmacy computers in the town were excluded from the dataset. However, this was largely because they were dispensed to people outside of the town, which was the area in which we were interested. Because the town is rather isolated, it was expected that many prescriptions would be for people living in rural areas outside of the town.

Since we could not classify the recipients of 3170 prescriptions as either children or adults, our estimates of number of prescriptions for children are likely to be too low. However, it is unlikely that this has led to the observed relationship between socioeconomic status and antibiotic use. If the birth dates of children from lower socioeconomic areas were less likely to be recorded than those from higher socioeconomic areas, we will have under-estimated the relationship between socioeconomic status and antibiotic use in children. Conversely if the birthdays of children from higher socioeconomic status areas are less often recorded, we will have over-estimated the relationship.

Nearly half of the people in the town received one or more prescriptions for an antibiotic during 2002. We cannot tell if this is typical for New Zealand as a whole, because comparable data is not available. The number of dispensings per capita in this study is slightly higher than that shown in the Pharmhouse database for New Zealand as a whole (data as yet unpublished), but this is likely to be due to unsubsidised prescriptions not being included in Pharmhouse. The proportions of different antibiotic classes dispensed in our study are similar to those prescribed by doctors in the NatMedCa study.\textsuperscript{12}

International comparisons are difficult to make. Many studies describe antibiotic use in terms of total consumption (as Defined Daily Doses (DDDs) or some other measure) per capita, per visit, or per diagnosis.\textsuperscript{13–15} It is impossible from this kind of

For this graph $y=0.0746x + 0.4636$. $R^2=0.7887$
data to determine the number of people who receive an antibiotic prescription in a year. The few studies which provide this type of data show high levels of exposure to antibiotics amongst the general population. In Umbria, Italy, 44% of the general population and 70% of under five year olds received one or more antibiotic prescription during 1999.  

In North Jutland, Denmark, half of 1 to 2-year-old children received at least one prescription during 1997.  

In our study, females received far more prescriptions than males and children received more prescriptions than adults. The number of prescriptions for females is likely to be related to greater consultation and prescribing rates for women and to much higher rates of urinary tract infections in women. A significant proportion of the antibiotics dispensed in the town during the year were possibly for urinary tract infections (e.g. nitrofurantoin). It was expected that children would get more antibiotic prescriptions than adults, as children are more vulnerable than adults to respiratory conditions and infectious diseases.  

Rates of prescriptions were highly correlated with socioeconomic status. This is likely to be due to higher rates of infection in lower socioeconomic communities.  

Salmond and Crampton found much higher levels of hospitalisation for infectious diseases (for all ages and both sexes) among those who lived in areas of higher deprivation in New Zealand.  

Financial and other barriers to access to health services may reduce the observed effect of socioeconomic status. If these barriers were reduced (e.g. if GP visits were free), the relationship between socioeconomic status and prescription rates may become stronger. Other factors which could influence the relationship are patient expectations, understandings of antibiotics, and strategies used by doctors for patients of different backgrounds.  

The use of NHI numbers on prescriptions would reduce some of the problems involved in this kind of research. Coding of age and sex would be much easier. The ability to link NHI number to reliable ethnicity data would allow analysis by ethnic group, and this would make a significant contribution to understanding of health services use by Maori and non-Maori New Zealanders.  

One of the major advantages of using data from pharmacy dispensing computers is the inclusion of unsubsidised prescriptions. Many of the antibiotic prescriptions dispensed were for amoxycillin or amoxycillin/clavulanic acid, and are likely to cost less than the relevant patient contribution, and therefore not be included in data on subsidised prescriptions.  

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References:


**Abstract**

*Aims* To review the cases of tuberculosis found at autopsy in the Auckland Coronial Autopsy Service in the previous 10 years, and compare the results with that of a similar study for the period 1975 to 1992. Cases which were not diagnosed prior to autopsy are scrutinised as to why the diagnosis may have been missed.

*Methods* A computerised search of the Forensic Pathology Department database at Auckland Hospital for cases of tuberculosis or atypical mycobacterial infection found at autopsy was done. Basic demographic data, past medical history, and police reports were analysed. The cases were placed into five groups for analysis.

*Results* A total of 30 cases of tuberculosis (including 3 cases of atypical mycobacterial infection) were found. A large proportion (70%) was undiagnosed before death, and each case was potentially infective. Two cases had respiratory symptoms suggestive of tuberculosis, and a further 5 cases had generalised symptoms which were unexplained yet tuberculosis was not considered.

*Conclusions* In those cases that were missed, the autopsy played a vital role by identifying the previously undiagnosed cases of tuberculosis and ensuring contact screening. Awareness of tuberculosis and its increasing prevalence in New Zealand is essential for minimising missed diagnoses.

The incidence of tuberculosis in New Zealand has been slowly increasing in recent years. According to the 2003 World Health Organisation (WHO) Report on Global Tuberculosis Control\(^1\) the incidence of tuberculosis in New Zealand has risen from 8 per 100,000 in 1993, to 12 per 100,000 in 1999. Recently published guidelines for tuberculosis control in New Zealand\(^2\) show a trend towards a slight increase in the incidence of tuberculosis since 1988 with the current average annual incidence being 10 per 100,000. This trend has been mirrored in the Auckland region, where the incidence is one of the highest in the country.

The annual incidence, from 1992 to 1993, in the Auckland region was 15.9 per 100,000,\(^3\) and this has risen to 21.2 per 100,000 in 2001\(^4\). Tuberculosis, once thought to be rarely encountered in clinical practice, is still prevalent in many communities. For this reason, doctors need to consider the possibility of tuberculosis, particularly in high-risk groups.

The aim of this study is to examine cases of tuberculosis found at autopsy in the Forensic Pathology Department, Auckland Coronial Autopsy Service (which serves a population base of approximately 1 million), Auckland Hospital, between January 1994 and June 2004 (inclusive); a period of approximately 10 years.

The results are compared to that of a similar study\(^5\) undertaken in the Forensic Pathology Department of the School of Medicine, Auckland, for the period 1975 to 1992. The main area of interest is in ascertaining the proportion of cases of...
tuberculosis which were not diagnosed in life; in other words, cases which were not expected. We examine the possible reasons why this may have occurred. In the Discussion, we illustrate a few cases where public health could have been severely compromised.

Methods

A computerised search was done for cases with tuberculosis (or atypical mycobacterial infections such as that due to *Mycobacterium avium intracellulare*) amongst autopsies performed between January 1994 and June 2004 (inclusive) in the Forensic Pathology Department, Auckland Coronal Autopsy Service (now operated by Lab Plus Ltd), Auckland Hospital.

The autopsy reports (along with the accompanying police and medical reports) were accessed and analysed. Basic demographic data (such as the deceased's age, sex, and ethnicity, along with medical history) were recorded. Both gross and histological findings at autopsy were recorded. The cause of death was noted, in as far as whether tuberculosis was the cause of death or not.

After examination of the above data, cases were divided into five groups, similar to that in Christiansen and Koelmeyer.5

**Group 1**—The patient had symptoms and/or signs of respiratory compromise (such as productive cough or shortness of breath), but tuberculosis was not considered or investigated.

**Group 2**—The patient had generalised symptoms such as weight loss and malaise, but was not investigated for tuberculosis.

**Group 3**—The patient had concurrent illnesses, such as chronic emphysema, heart failure, and other chronic illnesses, which detracted the doctor from considering tuberculosis.

**Group 4**—There was no possibility of making a diagnosis of tuberculosis, as the patient did not present to a doctor prior to death, or the medical history was brief or non existent.

**Group 5**—Tuberculosis was correctly diagnosed or known about, but a cause of death was not immediately apparent, hence the need for an autopsy.

Comparison of the results with that of the previous study looking at cases of tuberculosis from 1975 to 1992 (by Christiansen and Koelmeyer)5 was also performed.

Results

A total of 13,866 autopsies were performed during the period January 1994 to June 2004 (inclusive). There were 27 cases of tuberculosis and 3 cases of *Mycobacterium avium intracellulare* infection. An additional 4 cases were not included as the autopsy evidence for tuberculosis was tenuous (i.e. no histological or microbiological confirmation). In comparison, there were 34 cases of tuberculosis during the period 1975-1992 (inclusive); a period of 17 years during which a total of 28,090 autopsies were performed.

In 13 cases, the causative organism was identified by culture, and antibiotic sensitivity data was available in 8 cases. Of these, only 1 case grew a strain of *Mycobacterium tuberculosis* resistant to all 5 antibiotics (isoniazid, rifampicin, ethambutol, pyrazinamide, and streptomycin) and, in the remaining 7 cases, the organism was sensitive to all 5 antibiotics. In a further 3 cases, an organism was not grown but was identified by DNA probe using polymerase chain reaction (PCR).

In the remaining 14 cases, acid fast bacilli were identified on histology sections but, on culturing, the organism failed to grow and the PCR technique was not readily available.
There were equal numbers of males and females. The age of the deceased ranged from 27 years to 89 years with the mean age being 66.8 years. More than half were over the age of 65 years (Figure 1).

Figure 1. Comparison of age groups (1975–1992 and 1994–2004)

Polynesians (14 cases; 47%) were the predominant ethnic group represented, and combined with the Maori (4 cases; 13%), made up 60% of the cases (Figure 2). This proportion is even more striking given that the majority of autopsy cases at Auckland Hospital are Caucasians (see Table 1). Asians (5 cases) made up 17% of the cases, with a sole case in a person of African descent.

Figure 2. Ethnicity of cases of tuberculosis at autopsy 1975-1992 and 1994-2004
Table 1. Ethnicity of autopsies and cases of tuberculosis (1994-2004)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian</td>
<td>11,171 (81%)</td>
<td>6 (20%)</td>
</tr>
<tr>
<td>Maori</td>
<td>1,001 (7%)</td>
<td>4 (13%)</td>
</tr>
<tr>
<td>Polynesian</td>
<td>1,312 (10%)</td>
<td>14 (47%)</td>
</tr>
<tr>
<td>Asian</td>
<td>370 (3%)</td>
<td>5 (17%)</td>
</tr>
<tr>
<td>Other or not stated</td>
<td>12 (&lt;1%)</td>
<td>1 (3%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>13,866 (100%)</td>
<td>30 (100%)</td>
</tr>
</tbody>
</table>

Tuberculosis was the cause of death in 21 (70%) of the cases.

The results for the five groups are as follows:

- **Group 1**—There were two cases where the patient had respiratory symptoms and/or signs but tuberculosis was not considered or investigated.

- **Group 2**—Tuberculosis was not considered in five patients who had generalised symptoms such as weight loss or malaise.

- **Group 3**—Six patients had concurrent illnesses (predominantly chronic emphysema and heart failure) which detracted the doctor from investigating for tuberculosis.

- **Group 4**—Eight patients had brief medical histories or had not seen a doctor prior to death, and therefore, a diagnosis of tuberculosis could not have been reasonably expected.

- **Group 5**—Nine patients were known to have tuberculosis or were correctly diagnosed; however, due to uncertainty as to cause of death, an autopsy was performed. (Interestingly, four of these nine patients died of diseases other than tuberculosis, thereby justifying the need for an autopsy examination.)

The finding of tuberculosis at autopsy was unexpected so clinically undiagnosed in life in 21 cases (70%), compared to 22 cases (64.7%) in 1975–1992. The proportion of missed cases with respiratory symptoms has decreased, with only 2 cases (9.5%) from 1994 to 2004 compared to 6 cases (27%) from 1975 to 1992. The case groups are summarised in Figure 3.
Discussion

Our results show that a large proportion (70%) of cases of tuberculosis found at autopsy are unexpected, and have not been diagnosed in life. As such, the autopsy was vital in ensuring that screening of contacts occurred. Large studies conducted in Poland and Germany looking at the frequency of undiagnosed tuberculosis at autopsy, similarly found high rates. Rowinska-Zakrzewska et al found that the rate of missed diagnoses was higher during the period 1982–92 (54%) than during 1972–81 (24%). They attributed this to the decline in incidence of tuberculosis and, therefore, the lack of experience of medical professionals in recognising the disease.

There are several reasons why the diagnosis may be missed or delayed. A study conducted in Auckland by Calder et al looked at reasons why the diagnosis of tuberculosis was delayed. Reasons ranged from symptomatic patients not seeking medical attention to doctors not investigating the possibility of tuberculosis despite suspicious symptomatology. Occasionally, the diagnosis was delayed simply because the doctor did not enquire about exposure to tuberculosis and the patient did not volunteer that information.

The varied presentation of tuberculosis has been long recognised, and to make the diagnosis, one must think of the possibility of tuberculosis. One of our cases was an elderly man who presented with a protracted history of weight loss, decreased appetite, and breathing difficulties. The doctor diagnosed liver cancer as there was a family history of haemochromatosis. At autopsy, no liver cancer was present but there was bilateral pulmonary tuberculosis with abscess formation.

An elderly Asian man presented to a medical centre with weight loss, blood in the urine, and general ill-health over some months. He was treated with antibiotics for a
bladder infection. The possibility of prostate cancer was also noted. Autopsy revealed extensive tuberculosis in one lung with no evidence of prostate cancer.

Occasionally doctors do not consider tuberculosis because of concurrent illnesses that can produce symptoms that are indistinguishable from tuberculosis. An elderly Caucasian man presented to his general practitioner with cough, sputum production, and general malaise. He had a long history of emphysema, and was a smoker. He was treated with steroids for 1 month but slowly deteriorated. A chest X-ray done shortly prior to death showed a lung mass, possibly tuberculous in nature. Autopsy revealed tuberculosis in the lungs. A further similar case of an elderly woman on steroids also developed active tuberculosis; however, the exact duration of the steroid treatment was not known.

In these two cases, the immunosuppressive effects of the steroids may have facilitated bacterial growth.

We had three cases where an overseas visitor or immigrant had tuberculosis without anyone being aware. A Polynesian man and an Asian man, both visitors in New Zealand, had tuberculosis but did not seek medical attention prior to their deaths. An elderly Asian who recently migrated to New Zealand received renal dialysis for 3 weeks prior to death. Autopsy showed active tuberculosis, although infectivity was probably low as pulmonary involvement was minimal. Nevertheless, the situation could have been disastrous had he infected others in the Renal Dialysis Unit.

Tuberculosis in visitors and immigrants, particularly from high-risk areas such as Asia and the Pacific Islands, is a recognised problem. The majority of cases of tuberculosis in New Zealand occur in those born overseas and, furthermore, immigrants may harbour multi drug-resistant strains. The finding of multi drug-resistant strains is a well-recognised problem worldwide which is, at present, rare in New Zealand.

Screening of visitors (usually consisting of a chest X-ray and medical examination [New Zealand Immigration Service Administration Document, 2004]) is undertaken only if the visit is of a sufficient duration. The screening requirements are becoming more stringent and are in a state of flux at present, particularly with regard as to what constitutes a sufficient duration.

Missing the diagnosis of tuberculosis can have major consequences, both for the patient and the public at large. We have already highlighted the potential harm when a man receiving renal dialysis had undiagnosed tuberculosis. The following two cases further illustrate that point.

The first case was an elderly Polynesian female who was admitted to hospital 4 months prior to death with breathing difficulties. She was diagnosed with heart failure, which can unfortunately mask X-ray changes of tuberculosis, and treated with diuretics. On the evening of her death, she was coughing up blood-streaked sputum and her daughter-in-law summoned the ambulance. On arrival of the ambulance, the deceased had stopped breathing and cardiopulmonary resuscitation (which would have entailed mouth-to-mouth resuscitation) was initiated by ambulance staff, but with no success.

The second case was also an elderly Polynesian female who was referred to hospital for investigations as the general practitioner suspected tuberculosis. Unfortunately,
the deceased deferred going to the hospital and deteriorated rapidly at home. She coughed up copious amounts of blood and collapsed. Her son-in-law initiated cardiopulmonary resuscitation (CPR) after contacting the ambulance service. On arrival, the ambulance officers continued CPR, but with no success.

Both cases were found to have extensive involvement of the lungs by tuberculosis and would have been highly infective. One is reminded of the remark made by Cornet in Osler’s *The Principles and Practice of Medicine*,¹¹ ‘The consumptive in himself is almost harmless, and only becomes harmful through bad habits.’

The risk of unrecognised tuberculosis not only extends to the public but also to health professionals as we have discussed. The risk to mortuary staff, including forensic pathologists, is also well documented. In a review on the biosafety considerations for autopsies, Nolte et al¹² found that the occupational rate of tuberculosis amongst pathologists involved in the performance of autopsies was 10%—compared to 1% in clinicians, and 4% in pulmonary and tuberculosis specialists.

Measures to minimise the risk to mortuary staff include the use of N95 respiratory masks and performing the autopsy in the infection suite, which isolates the body and minimises exposure to staff. Those exposed to tuberculosis while performing an autopsy are required to notify Occupational Health. Tuberculin skin testing (Mantoux), and possibly chest X-rays, are performed to determine the presence of infection.

Each case of tuberculosis identified at autopsy is referred to the Medical Officer of Health, who then determines the period of infectiousness and initiates contact testing according to the recently published guidelines for tuberculosis control in New Zealand.² Contacts are prioritised into higher- and lower-risk groups based on factors such as closeness of contact and the immune status of the contact. Contact assessment is done within 3 days of notification for high risk contacts and within 7 days for those with a lower risk. Investigation of contacts includes tuberculin skin testing and chest X-rays or urinalysis, as appropriate.

Liaison with infectious disease and or pulmonary specialists plays a vital role in assessing the need for treatment of contacts, particularly those with a positive Mantoux (or those with a conversion to a positive Mantoux). Treatment is promptly given to those who have developed tuberculosis, and is offered to those with latent tuberculosis infection which usually lasts 6 months. Treatment may need to be altered depending on liver function tests.

Our results have shown that tuberculosis can be missed if it is not considered as a possibility. The protean presentation of this disease is well known, and it must be seriously considered in high-risk groups. Poverty and racial predispositions have also been long recognised.¹¹

In Auckland, and other regions of New Zealand, the incidence of tuberculosis in the Polynesian and Maori communities was 30 and 13 times (respectively) that of the Caucasian population in 2002.⁴ The incidence was even higher (60 times that of Caucasians) for those in other ethnic groups (which included Asians).

On preventing tuberculosis, Osler noted: ‘First, education of the public.’ This rings true now more than ever, and the education should probably extend to health professionals as well, given our results. Only then, can tuberculosis be an infectious...
disease viewed in full light rather than one which is cloaked in shadow, ready to pounce on the unwary.

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**Mycobacterium fortuitum** infection caused by a cat bite

Natalie Ngan, Arthur Morris, Tristan de Chalain

In recent years, infections caused by mycobacteria other than *Mycobacterium tuberculosis* have been increasingly reported. *Mycobacterium fortuitum* is a rapidly growing mycobacterium and can be found in soil and natural water supplies. While it is one of the most common nontuberculous mycobacteria (NTM) associated with nosocomial disease, it has mainly been associated with wound infections, particularly after trauma.1,2

Infections caused by bites from animals are not uncommon and infections with *M. fortuitum* after a dog bite have been described.3 However no case following a cat bite has been reported.

**Case report**

A 44-year-old, previously fit and well woman presented with a 6 months’ history of a slowly enlarging lesion on the volar aspect of her left forearm. She had initially developed a small red nodule following a cat bite at that site. The painful, shiny, raised, erythematous area did not settle in the months following the bite. After 2–3 months, she presented to her general practitioner (GP) because the lesion was enlarging distally and had begun to discharge serous fluid.

The lesion had remained localised and there was no regional lymphadenopathy. The nodule was lanced in the GP’s rooms. Only serous fluid was encountered; no pus and no foreign bodies were discharged. Nothing was sent for microscopy or culture. She was commenced on a course of oral amoxycillin-clavulanate but without improvement.

A referral was made to a plastic surgeon who prescribed a further course of oral antibiotics. The lesion, however, continued to enlarge and was now occasionally discharging pus. A second plastic surgical consult was sought, from a different surgeon, now 6 months following the cat bite. An atypical infection was suspected and an excisional biopsy of the lesion was performed under general anaesthesia. The lesion was excised en bloc and then divided into three parts; two fragments were submitted for culture and one portion for histology.

Both portions sent for culture were processed for bacterial and mycobacterial culture. On Gram stain, neither polymorphonuclear leukocytes nor organisms were seen and cultures were sterile after prolonged (14 days) incubation. Mycobacterial cultures were performed on solid medium, at 27 and 36°C, and liquid medium at 36°C. *Mycobacterium fortuitum* was recovered from the liquid culture after 7 days’ incubation at 36°C. The isolate was susceptible to amikacin, ciprofloxacin, imipenem, cefoxitin, sulphonamide, doxycycline, and clarithromycin.

Histopathology revealed a central localised area of lipogranulomatous inflammation. The inflammatory cells included epithelioid histiocytes, multinucleated giant cells, lymphocytes, and occasional neutrophils. The overlying epidermis was intact and
showed no significant epidermal hyperplasia. Special stains for bacteria, acid-fast bacilli, and fungal elements were negative.

The surgical wound healed well and no recurrences were observed at 1-year follow up.

Discussion

Clinical disease caused by rapidly growing mycobacteria usually follows accidental trauma or surgery in a variety of clinical settings.\textsuperscript{1,2} \textit{M. fortuitum} is one of the NTM species that most commonly causes localised infections of the skin and subcutaneous tissue.\textsuperscript{3,4} Diagnosis is made by culture of the specific pathogen from drainage material or tissue.

The incubation period between the time of injury and the onset of symptoms is an important diagnostic feature in infections caused by mycobacteria. It averages 1 month and can be as long as 6 months.\textsuperscript{3} Pain, local swelling, and mild serous drainage are typically present. Systemic symptoms are rare. The aetiology of the infection can be suspected by the history of trauma, the relatively long incubation period, the absence of serious or systemic symptoms, and the nonpurulent serous nature of the drainage. Definitive diagnosis depends on culture of the organism.\textsuperscript{3,5}

\textit{M. fortuitum} infections caused by animals are not uncommon. Usually the infective organism is a part of the bacterial flora of the animal, but in some cases the animal may have become contaminated or infected with an organism from the surrounding environment and so is able to transmit it.\textsuperscript{6}

\textit{M. fortuitum}, like other rapidly growing mycobacteria, are environmental microorganisms isolated from diverse habitats, most commonly water and soil.\textsuperscript{7} It is also present in the saliva and sputum of asymptomatic people.\textsuperscript{8} Infection, at least in humans, is usually associated with an underlying immunosuppressive condition such as cancer, corticosteroid administration, trauma (surgical or accidental), or chronic renal failure.\textsuperscript{9} They are usually considered to be non-pathogenic unless introduced deep into the body.\textsuperscript{10}

Ip and Chow reported five cases of \textit{Mycobacterium fortuitum} infections in the hand.\textsuperscript{10} Trauma was the main precipitating factor in all cases; three of the five followed local steroid injections from a single practitioner. The authors concluded that a high index of suspicion was important to obtain the correct diagnosis. NTM infection should be suspected when infection follows trauma and responds poorly to standard antibiotics as in our patient. Examination of the tissue to confirm the diagnosis is recommended followed by a combined approach of early radical debridement and appropriate antibiotic therapy to give the best chance of controlling the infection.\textsuperscript{10}

Surgery is generally indicated with extensive disease, abscess formation, or where drug therapy is difficult. Removal of local foreign bodies (e.g. breast implants and percutaneous catheters) is important, or even essential, for recovery.\textsuperscript{11–13}

Because of differences in susceptibilities among species of rapidly growing mycobacteria (and even within species), susceptibility testing should be performed on all clinically significant isolates as well as isolates that have been recovered after treatment failure or relapse.\textsuperscript{11,13}
Treatment of *M. fortuitum* infections can be extremely challenging because of its resistance to traditional anti-tuberculous drugs and commonly used antibiotics. Resistance often develops with monotherapy, necessitating a multi-drug combination. Recommended duration of therapy varies from 3–4 months depending upon clinical resolution. There have been estimates that approximately 10 to 20% of infections will resolve within a few months (either spontaneously or following surgical debridement, as in our patient).

**Conclusion**

Our case illustrates that cats can be added to the list of animals that can inoculate people with NTM. An appropriate history, physical examination, and failure to respond to commonly used antibiotics might suggest an infection with an NTM organism. In our case, resolution of the infection was achieved with surgical excision alone.

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Idiopathic granulomatous hypophysitis

Victoria Stott, Patrick Manning, Noelyn Hung

Granulomatous hypophysitis is a rare pituitary condition not often diagnosed preoperatively. Secondary causes include several systemic inflammatory conditions. A trial of high-dose steroid treatment may be suitable in those patients with evidence of systemic inflammatory disease, panhypopituitarism, and typical radiological features—and could avoid the need for invasive pituitary surgery.

Case report

A 63-year-old postmenopausal female presented with a 2-month history of lethargy, weakness, and weight loss. She was feeling the cold and had noticed dry skin and constipation. Past history was unremarkable and she was taking no regular medications. On examination, she appeared hypothyroid with dry, cool skin; periorbital oedema; and bradycardia. There were no features to suggest Cushing’s disease or acromegaly. Blood pressure was 110/60 mmHg with no postural change. Visual fields were full to confrontation.

Investigations showed panhypopituitarism. An MRI scan showed a diffusely enlarged pituitary gland with suprasellar extension measuring 2.0 x 1.5 x 1.0 cm, consistent with a pituitary macroadenoma. Formal visual field testing was normal. Treatment was commenced with hydrocortisone followed by the addition of thyroxine.

Figure 1. Pituitary tissue with epithelioid and multinucleate giant cells surrounded by mature lymphocytes
She underwent transphenoidal resection of the pituitary mass lesion. Histology (Figure 1) showed scattered non-necrotising epithelioid granulomata and multinucleate giant cells consistent with granulomatous hypophysitis.

Gram stain, fungal, and mycobacterial stains showed no organisms. Investigations to exclude a secondary cause of granulomatous disorders revealed a normal chest X-ray, calcium, serum angiotensin converting enzyme (ACE), antineutrophil cytoplasmic antibodies (ANCA), and syphilis serology—indicating idiopathic granulomatous hypophysitis. Postoperatively, she developed diabetes insipidus. Three months later she remains well with no recovery of pituitary function.

Discussion

Hypophysitis is an inflammatory condition of the pituitary gland, often mistaken for other pituitary mass lesions. There are three distinct clinicopathological entities: lymphocytic, xanthomatous, and granulomatous hypophysitis.\(^1\)

Lymphocytic hypophysitis has a female preponderance of 8:1 and typically occurs during late pregnancy or postpartum. It is associated with lymphocytic thyroiditis or adrenalitis in 25% of cases. Histology shows a diffuse infiltrate of lymphocytes.\(^1\)

Xanthomatous hypophysitis is the least common of the three entities and resembles other conditions such as xanthomatous pyelonephritis or cholecystitis. It may appear cystic at the time of surgery and histology shows lipid-rich foamy histiocytes with variable numbers of lymphocytes.\(^1\)

Granulomatous hypophysitis, which accounts for less than 1% of all pituitary disorders,\(^1\) has an average age of diagnosis greater than 40 years with no gender predilection.\(^2,3\) Secondary causes include infection (tuberculosis, syphilis, fungal), systemic inflammatory conditions (sarcoidosis, Wegener’s granulomatosis, Takayasu’s arteritis, Crohn’s disease, histiocytosis X) and foreign body reactions (ruptured Rathke’s cyst, mucocele).\(^1-5\)

Patients may present with panhypopituitarism, diabetes insipidus, or hyperprolactinaemia, symptoms of local mass effect, or pituitary apoplexy.\(^2-5\) The degree of hypopituitarism is often out of keeping with the size of the lesion.\(^2,3,5\) MRI features are of a diffusely enlarged homogeneous pituitary gland with a thickened pituitary stalk and suprasellar extension.\(^4,5\) Histologic appearance is of granulomas with epithelioid cells and multinucleated giant cells, and variable numbers of lymphocytes and plasma cells.\(^1\) Additional staining should be undertaken to exclude underlying infection.\(^3\)

Isolated cases, particularly those with an underlying systemic granulomatous condition, have been successfully treated with high dose steroids with resolution of clinical and radiological findings,\(^1,4\) whereas others have not shown a response.\(^5\) Identifying which patients may be suitable for a trial of steroids is difficult preoperatively. Surgery, which is both diagnostic and therapeutic, is typically via the transphenoidal approach.\(^1,5\) Postoperatively, hypopituitarism has been shown to resolve in some cases, but many will remain on full hormone replacement therapy\(^1,3,5\) such as our patient.

In conclusion, granulomatous hypophysitis is a rare pituitary condition that is difficult to diagnose preoperatively. In those with evidence of systemic inflammatory disease,
panhypopituitarism, and typical radiological features, a high index of suspicion may allow a trial of high dose steroid treatment in suitable patients. In our patient, however, the size of the lesion meant that surgical decompression was the initial treatment of choice.

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Avoiding liability under the Commerce Act—what can be learned from the ophthalmologists’ case?

Yvonne van Roy

Abstract

**Aim** To consider the application of the Commerce Act 1986 to the conduct of medical practitioners and practitioner associations and societies, with special reference to the recent *Ophthalmologists’* case and the lessons which can be learned from that.

**Discussion** The Commerce Commission recently took successful action (under Section 27 [s27] of the Commerce Act) against the Ophthalmological Society of New Zealand and several ophthalmologists from the lower South Island. The case illustrates the ease with which practitioners can be drawn into anticompetitive arrangements, and practitioner associations and societies can become liable under the Act through the conduct of their officeholders. The article discusses the relevant prohibitions under the Act, and the way in which these can relate to individual practitioners and practitioner associations and societies. In particular, s27 applies not only when the purpose of an arrangement substantially lessens competition, but also when the effect or likely effect of the arrangement substantially lessens competition. Therefore arguing that conduct is for ethical or safety reasons will not be sufficient to avoid liability.

**Conclusion** Markets for medical services are treated just like the markets for most other services under the Commerce Act. Individual practitioners should avoid becoming involved in or giving support to conduct or arrangements, which may be anticompetitive. Practitioner associations and societies should exercise control over the actions of their officeholders, especially where the purpose or effect of these could be considered to be anticompetitive.

The recent decision of the High Court in *Commerce Commission v The Ophthalmological Society of New Zealand Inc (et ors)*1 has highlighted the need for a better understanding amongst medical practitioners of the application of the Commerce Act 1986 to practitioners and practitioner associations and societies. The case involved an arrangement between ophthalmologists which hindered the efforts of Southern Health to hire an Australian ophthalmologist to reduce its unacceptably high waiting list for cataract surgery. The proposal from the Australian surgeon was at a very favourable price.

The incumbent ophthalmologist objected strongly to the hiring of the Australian surgeon and entered into an arrangement to oppose this with the ophthalmologist from Canterbury Health who was assisting during weekends once a month. Other ophthalmologists from Canterbury Health were drawn into that arrangement after the views of the two surgeons were discussed at a meeting, the minutes for which recorded unanimous support for the incumbent surgeon’s ‘predicament.’ Two ophthalmologists from that meeting contacted the president of the Ophthalmological Society of New Zealand (OSNZ) to enlist its help, and the supporting conduct of its...
president, on behalf of OSNZ, drew that society into the arrangement also. The result of this opposition was that the Australian surgeon was unable to obtain the necessary ‘oversight’ (required because he would be practicing in New Zealand for less than 4 months).

He therefore cancelled his proposal with Southern Health, and the surgery was eventually carried out by the incumbent ophthalmologist and two other ophthalmologists from Canterbury Health, all of whom were parties to the illegal arrangement. Although it was clear that the parties were not aware that their conduct might contravene the Commerce Act, all defendants were found to have contravened that Act, and some have incurred pecuniary penalties.² It would be helpful, therefore, to consider the relevant provisions of the Commerce Act and how these might apply to medical practitioners and their associations and societies.

What conduct does the Act cover?

In brief, the Commerce Act prohibits the following anti-competitive practices:

- Contracts, arrangements, and understandings which have the purpose, effect, or likely effect, of substantially lessening competition in a market (s27). This includes price fixing contracts, arrangements, and understandings (between competitors) (s30);
- Contracts, arrangements, and understandings (between competitors) containing exclusionary provisions (s29). There is an exception in s29(1A) whereby a contract arrangement or understanding containing an exclusionary provision will not contravene s29 if it is shown not to have the purpose, effect, or likely effect of substantially lessening competition in a market;
- Resale price maintenance (ss37 and 38); and
- Abuse of market power by any person with a substantial degree of market power (s36).

The application of the Act to individual practitioners

There are no special provisions in the Commerce Act relating to medical services—markets for medical services are covered in the same way as markets for most other services. The services of medical practitioners are covered by the Act unless the work is undertaken under a contract of service (i.e. an employment contract).³ So while practitioner groups or associations can negotiate the terms and conditions of work of practitioner employees, they cannot negotiate such contracts for independent contractors without contravening the Commerce Act.⁴

The provisions relating to contracts, arrangements, or understandings are more relevant to medical practitioners—as an individual medical practitioner would need to have a substantial degree of power in the relevant market in order for s36 to be considered. Indeed, for a single practitioner to have a substantial degree of power in the market, he or she would need a high degree of freedom from the constraints which would otherwise be imposed through the conduct of competitors, suppliers, or customers.⁵
The application of the Act to practitioner associations and societies

The definition of ‘person’ in s2 of the Commerce Act includes associations of persons, whether incorporated or not. As the market power exercised by a practitioner association is really the collective market power of its members, it is usual to consider the conduct of such associations under the provisions relating to contracts arrangements or understandings (s27, s29, and s30), although a case of abuse of market power under s36 may also be possible.

The Act provides that any contract, arrangement, or understanding entered into or arrived at by an association or body of persons is deemed to be entered into or arrived at by its members. The Act also deems recommendations made by an association or body of persons to its members to be an arrangement between the members, and between the members and the association, regardless of anything to the contrary which may be in its constitution or rules.

As members will usually be competing with each other, these deeming provisions help to prove the existence of an arrangement between competitors, necessary for actions under sections 29 and 30. Although the Act provides a way for individual members to avoid liability in these situations, it is unlikely that any penalty would be imposed on anyone not directly involved in an illegal practice.

An association or society may become subject to the Act through the conduct of its office holders acting within the scope of their actual or apparent authority. The conduct of such officeholders is deemed to be the conduct of the association or society. Thus, the OSNZ became a party to the illegal contract through the conduct of its president, entered into on behalf of the society. This places a significant responsibility on those with apparent authority to take care to ensure that their conduct on behalf of the society is properly authorised by that society.

Becoming party to an illegal contract, arrangement, or understanding

Section 27, s29, and s30 require the existence of a contract, arrangement, or understanding. There is considerable case law concerning what is required for the finding of an arrangement or understanding. This was summarised by the majority of the Court of Appeal in their recent decision, Giltrap City Ltd v Commerce Commission:

‘Before there can be an arrangement under s27 (or for that matter an understanding) there must be a consensus between those said to have entered into the arrangement. Their minds must have met – they must have agreed – on the subject matter. The consensus must engender an expectation that at least one person will act or refrain from acting in the manner the consensus envisages.’

In the OSNZ case, there was a consensus among the ophthalmologists to oppose the entry of the Australian surgeon. There was therefore an arrangement between them, which led to action being taken by some of the parties to further this objective.

It is important to note that the act of entering an anti-competitive arrangement is sufficient for a contravention of s27. Actions taken by individual ophthalmologists to deter entry of the Australian surgeon (such as refusal to provide the necessary ‘oversight’), while unhelpful, would not in themselves contravene the Act. However,
when such actions are taken after an illegal arrangement has been entered into, as in this case, they provided evidence of the existence of the arrangement and of its purpose.

It did not help that the President of the OSNZ called the Registrar of the Medical Council and intimated that the capacity to obstruct the registration of the Australian surgeon could be in the hands of the resident ophthalmologists (for that surgeon could not practice in New Zealand unless oversight could be arranged).

**Actions under Section 27 of the Act**

Section 27(1) of the Commerce Act provides:

> ‘27 (1) No person shall enter into a contract or arrangement, or arrive at an understanding, containing a provision that has the purpose, or has or is likely to have the effect of substantially lessening competition in a market.’

After finding the existence of a contract, arrangement, or understanding, and determining the relevant market, it is necessary to show that a provision of the contract, arrangement or understanding has the purpose, effect, or likely effect of substantially lessening competition in that market.

In the OSNZ case, the parties had argued that their behaviour was motivated by concern that the proposal of the Australian ophthalmologist had not provided for the necessary ongoing postoperative care, and so would jeopardise patient safety. The Court did not accept that this was the reason for the conduct of the parties as none of them knew the exact nature of the proposal (which had provided for postoperative care), and much of the communications from the parties had emphasised the necessity for Southern Health to have offered the surgery to the incumbent surgeon, or to have sought his approval before offering it to others.

However s27 raises further issues which indicate that it is unwise to rely on the argument that there were good reasons for the conduct (such as patient safety), in order to escape liability.

Firstly, the *reason* for engaging in conduct (which may differ as between the parties) is not the same as the *purpose* of that conduct. Purpose is defined as object or aim, such that ‘the conduct producing the consequences was motivated or inspired by a wish for the occurrence of the consequences.’

The object or aim of the parties in the OSNZ case was to prevent the entry of the Australian ophthalmologist, whatever the reasons of the individual parties for desiring this outcome.

Secondly, the Act does not require the anti-competitive purpose to be the *only* purpose. It is sufficient that it is a *substantial* purpose. So, even if the court had accepted that a purpose was to prevent risks to patient safety, it was sufficient that the purpose of preventing entry to the market was a substantial one. The parties in the OSNZ case would have behaved quite differently if they did not have an anti-competitive purpose.

Thirdly, even if an anti-competitive purpose cannot be shown, s27 will still be contravened if the contract, arrangement, or understanding has the *effect or likely effect* of substantially lessening competition. It is important therefore that practitioners and practitioner associations and societies which have concerns about patient safety
arising from a proposal should follow only the procedures available to them under relevant legislation or regulations.

**Sections 29 and 30**

Section 30 deems price fixing arrangements between competitors to contravene s27. These contracts, arrangements, or understandings must have the purpose, effect, or likely effect of fixing, controlling, or maintaining the price of goods or services supplied or acquired by the parties, in competition with each other. This would include any arrangement between competing practitioners to fix fees for any of their services, or any attempt by a practitioner to induce a competing practitioner to fix fees. It would also include any price recommendations sent by practitioner associations to their members.

Section 29 prohibits contracts, arrangements, and understandings between two or more competitors, which contain exclusionary provisions. These are provisions which have the purpose of preventing, restricting or limiting the supply (or acquisition) of goods or services by one or more of the parties to (or from) a competitor. Successive amendments to the section have limited its scope, but it would cover an arrangement between a practitioner association and a supplier whereby the supplier agrees to supply only members of the association. It is possible also to consider the facts of the OSNZ case in terms of liability under s29. The purpose of the arrangement between the ophthalmologists was to hinder or prevent Southern Health from acquiring medical services from the Australian surgeon. Southern Health needed more than one ophthalmologist to perform the additional surgery, and the incumbent surgeon had made it clear that he would not share the work with the Australian surgeon.

In the end, Southern Health was forced to accept the work being shared by three of the parties to the illegal arrangement. The competition exception in s29(1A) would not have assisted the parties, for the Commission had already made out a successful case under s27 (purpose and effect of substantially lessening competition).

**Exceptions to the Act**

Only one exception has been specifically provided in the Commerce Act for anti-competitive contracts, arrangements, or understandings entered into to maintain quality. This is a contract, arrangement, or understanding which obliges a person to comply with or to apply standards of quality or performance prepared or approved by the Standards Association of New Zealand.

An exception to the trade practices provisions of the Act has been provided for any ‘act, matter, or thing that is, or is of a kind, specifically authorised’ by any other Act or Order in Council. However, this is unlikely to protect any conduct of medical practitioners or practitioner associations.

Since the decision of the Privy Council in *New Zealand Apple and Pear Marketing Board vs Apple Fields Ltd*, the words ‘specifically authorised’ have had an extremely narrow scope. So now when Parliament wishes to exclude some conduct from the ambit of the Commerce Act, this exclusion is expressly included in the relevant legislation. An example is the protection afforded to Pharmac under s2 of the Finance Act 1994.
The most relevant exception for the medical profession has been the provision in s5 (and perhaps also s6) which excludes conduct of the Crown (and Crown Corporations under s6) which is not ‘engaging in trade’. Section 5 has protected an agreement in 1988 between the New Zealand Medical Association and the Minister of Health concerning the benefit payable in respect of practitioners’ fees for child consultations, and the imposition of conditions with respect of these.

Summary

Medical practitioners and their associations and societies can avoid liability under the Commerce Act if they remember that markets for medical services are treated just like the markets for most other types of services under the Act.

Any arrangement between practitioners with the purpose, effect, or likely effect of substantially lessening competition (e.g. through hindering entry of a competitor) will contravene the Act, regardless of the reasons which individual practitioners may have for entering the arrangement.

Individuals should be cautious about lending support to an anti-competitive arrangement, because becoming part of the consensus will mean becoming party to the arrangement. Practitioner associations and societies should be especially careful because, along with their members, they may be liable for the conduct of their office-holders.

There are legitimate avenues available for the expression of concern about proposals involving medical services. It is these avenues which should be followed, to avoid possible liability under the Commerce Act from anti-competitive conduct, arrangements, or understandings.

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References:


2. The Ophthalmological Society was ordered to pay $100,000, the incumbent surgeon $25,000, and the other surgeon in the original arrangement $5,000, in addition to costs of nearly $468,000. The Judge noted that these were modest penalties reflecting the circumstances of the case and the “first time” nature of the proceedings so they were not to be taken as a guideline for future penalties which might be imposed. (Commerce Commission v The Ophthalmological Society of New Zealand, CIV – 1997-485-34, CP354/97, 30 June 2004, paragraph 50.).

3. Section 2 definition of “services”, and exception in s44(1)(f).

4. The Act enables the Commerce Commission to authorise practices which might otherwise contravene the Act, if the parties apply for authorisation and the Commission decides that there are sufficient benefits to the public to outweigh the detriments to competition. However, such authorisation is rarely given.

5. Of particular relevance are barriers to entry to the relevant market. See Brooker’s Gault on Commercial Law. Brookers Ltd, Wellington, paragraph CA36.08. In the Ophthalmologists
case, the incumbent surgeon did not have sufficient market power, on his own, to demand the price he wanted or to exclude his potential rival, so a case under s36 would have been extremely difficult to argue.

6. Section 2(8)(a).
7. Section 2(8)(b).
8. Section 2(9).
9. Section 90(2) or (4). The state of mind of the authorised person is also deemed to be the state of mind of the association or society (s90(1) or (3)).
12. Section 2(5).
13. These three ophthalmologists could be considered to be in competition with each other and the Australian surgeon, in relation to the supply of these additional services. (Competition between two or more of the parties, and between one or more of the parties and the “victim” of the arrangement is required by s29(1)(a) and s29(1)(b)).
14. Section 44(1)(e).
15. Section 43.
17. Section 2(3) of the Finance Act 1994 states that: “It is hereby declared that nothing in Part II of the Commerce Act 1986 applies, or has ever applied to – Any agreement to which subsection (2) of this section applies; or Any act, matter, or thing done by any person to give effect to such an agreement” (Subsection (2) refers to agreements between the Minister of Health and specified bodies (as defined in the section) relating to pharmaceuticals funded wholly or partly by those bodies).
18. Interpreted as “carrying on trade”, and will include non-profit enterprises, but not the exercise of regulatory functions even if this affects trade. See Re New Zealand Medical Association (1988) 7 NZAR 410; Glaxo New Zealand Ltd v A-G [1991] 3 NZLR 129; and ACCC v The Australian Medical Association Western Australia Branch Inc [2003] FCA 686; 199 ALR 423.
Book review and miscellaneous notes

This extract comes from the New Zealand Medical Journal 1905, Volume 4 (14), p140.

*Recurrent Effusion into the Knee-joint after Injury, with Special Reference to Internal Derangement commonly called Slipped Cartilage.* A clinical lecture delivered at St. George’s Hospital by Sir William Bennett, K.C.V.O., F.R.C.S. Illustrated. 8vo. Price, 3s. 6d. Published by Longmans, Green, and Co., 39, Paternoster Row, London.

This monograph takes under review some 750 cases in which effusion was recurrent either spontaneously or after injury. The treatment, operative and otherwise, is set out. There are several excellent illustrations of the anatomy, normal as well as pathological, which will be of great service in refreshing the memory of those having to deal with such cases. Coming from the pen of so distinguished a surgeon as Sir William Bennett, the advice given carries the very greatest weight.

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A MEDICAL man, who has kept a nightly record of his pulse for five years, says that every year it falls through the spring until about midsummer, and then rises through the autumn to November or December. Then comes a second fall and rise, culminating in February.

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NURSE (to doctor, who has just been called in): “It appears to be a very complicated case, doctor. Can you make anything of it?”

Doctor: “Well, between you and me, I think I can make a couple of hundred out of it: they’re very rich.”
Aquatic Injury

A 35-year-old male was rescued from the sea. Chest radiographs are presented on his arrival at hospital (Figure 1), and 24 hours later (Figure 2).

Questions:
What is the diagnosis and what is the prognosis?
Diagnosis – Near Drowning

Figure 1 shows pulmonary oedema pattern in the lungs representing a combination of aspirated sea water and permeability oedema. Figure 2 shows rapid resolution of these changes.

In near drowning, the extent and severity of the oedema depends on the amount of water aspirated, the degree of hypoxia, and the contamination in the water. Whether the water is fresh or salt makes no difference on the pulmonary findings.
More bad news about HIV and AIDS

The fight against Aids is being hampered by a massive shortage of condoms. Only about one tenth of the 10.8 bn needed were available in developing countries in 2003 and there seems little chance of meeting a target of 18.6bn by 2015.

The shortfall is partly due to a lack of funding by the United Nations Population Fund, which has had its income slashed by the Bush administration. The American right has lobbied strongly and successfully against giving money to agencies that support family planning clinics offering advice on abortion.

Mortality due to chickenpox (varicella), and immunisation

Apparently in the USA since implementation of the universal childhood varicella vaccination program in 1995, the incidence of disease declined by about 75%.

In a recent paper from Atlanta it has been demonstrated that there has been an even greater decline in varicella mortality rates. Methuselah notes that 9 deaths from chickenpox were reported in NZ between 1980 and 1993.

The NZ Ministry of Health position—

“At present, the varicella vaccine has not been added to the New Zealand Childhood Immunisation Schedule. There are two reasons for this decision:

- Fiscal considerations.
- Undesirability of adding another injection or immunisation visit to the Schedule.

If a tetravalent MMRV vaccine becomes available this recommendation could change.”

Autism and MMR again

An association between the measles-mumps-rubella (MMR) vaccine and autism was reported in the Lancet some years ago. This resulted in a heated controversy—the end result denied the association. Nevertheless the incidence of autism seems to have increased. In a paper from the Mayo Clinic it is pointed out there has been an increase in the incidence of autism among children in Minnesota, from 1976 to 1997, however, the MMR vaccine was introduced to Minnesota almost 20 years before the increase in the incidence of autism, suggesting that the MMR vaccine did not contribute to this phenomenon. The timing of the change in autism incidence is coincident with the introduction of broader diagnostic criteria, increased availability of education services, and increased awareness of autism.

Screening for colorectal cancer

Being the leading cause of cancer mortality makes screening for colorectal cancer a hot topic. So what is the current “gold standard”?

Well in the USA the most recent US Preventive Services Task Force recommendations for average-risk persons age 50 years or older call for an annual faecal occult blood test (FOBT) and either flexible sigmoidoscopy (every 5 years) or colonoscopy (every 10 years).

However, the recommendations are not very popular as an analysis of Medicare claims reveals that the mean rates of FOBT, screening sigmoidoscopy, and colonoscopy were 14.54%, 3.03% and 6.22%, respectively.

Obviously the screening techniques are intrinsically unattractive.


Hormone replacement therapy (HRT) and risk of stroke

Not too long ago, HRT was commonly used for the suppression of menopausal symptoms. It was believed that, as a bonus, HRT also protected against premature osteoporosis, heart attacks and strokes. Sadly, worries of increased breast cancer risk arose and the diminished heart attack risk was disproven.

And now, in a recent meta-analysis of 28 trials, with 39,769 subjects, it has been shown that HRT is associated with a significantly increased risk of stroke, particularly of ischaemic type. Among subjects who had a stroke, those taking HRT seemed to have the worse outcome.

The authors conclude that HRT “cannot be recommended for the primary or secondary prevention of stroke.”

Cord blood banking

We read with interest the editorial and viewpoint papers concerning cord blood banking that appeared in the NZMJ (Vol 118 No 1208, 28 January 2005. URL: http://www.nzma.org.nz/journal/118-1208/). As the Medical Director of Cordbank in New Zealand, I would like the opportunity to correct some inaccuracies in the papers and to put forward the private cord blood banking argument.

There have been about 6000 cord blood transplants performed around the world, and indeed more than 2000 were performed last year alone, which is substantially more than the 3000 claimed by Sullivan et al. Whilst the majority of cord blood transplants were performed using donated cord blood, a significant number used a matched sibling’s cord blood and there were some autologous transplants. In New Zealand, there is no public cord blood bank and therefore the only option for parents who wish to store their baby’s cord blood, is a private cord blood bank.

Under New Zealand law, Cordbank may only store cord blood for the person from whom it was taken. We acknowledge the usefulness of cord blood for a matched relative and are therefore meeting with the Ministry of Health in the hope of advancing a law change that would negate the need for parents to seek an exemption from the Minister of Health should cord blood be useful for a close relative.

Cordbank also rejects the criticism that our information does not differentiate between an allogeneic and an autologous transplant. We have modified our information in response to the Australasian Haematologists’ Society, and have had the changes approved by our Medical Advisor Dr Lochie Teague who is the Clinical Director of Paediatric Haematology at The Starship Hospital Auckland as well as medical advisor to Cordbank.

Cordbank would also fully support the establishment of a public cord blood bank should the funding become available for this. At present, where a cord blood unit is required for transplantation then the unit is purchased from an international cord blood bank at a cost to the New Zealand tax payer of up to $25,000.

Medsafe perform a stringent annual audit on Cordbank thus ensuring the quality of our product. There is also evidence that cord blood stem cells are viable after 15 years if stored in appropriate conditions, and hence it would seem possible to extrapolate that these cells are able to be stored indefinitely should the regenerative claims of cord blood stem cells become a reality.

Cordbank provides New Zealand parents with the option of cord blood banking. We make no untrue claims, have taken the best advice available and are processing the cord blood in compliance with the most stringent auditing conditions.

Mary Birdsall
Medical Director, Cordbank
Auckland
References:

Investigation for iron deficiency anaemia

Iron deficiency anaemia (IDA) is a common clinical problem presenting for endoscopic investigation. There are no data from New Zealand to guide clinicians in this country. Guidelines for the investigation of IDA have been published but these are frequently not strictly adhered to.\cite{1-4} It is commonly accepted that there is a high incidence of dual pathology and it is generally accepted that both upper and lower gastrointestinal (GI) investigations are necessary for a full GI workup in the investigation of IDA unless malignancy is clearly demonstrated on the initial endoscopic investigation.

Thus we performed a study to investigate the spectrum of disease found in patients who undergo a full GI workup for IDA in New Zealand. We were also interested in knowing whether on the basis of spectrum of disease, presenting symptoms or degree of iron deficiency it could be predicted which test might be the most appropriate initial endoscopic investigation.

A computerised Endoscopy Database (Endoscribe\textsuperscript{TM}) was used to look for patients who had IDA as an indication for upper and lower GI endoscopy at Hutt Hospital from May 1998 to January 2004. Males and females over the 50 years of age were included in the study. Patients were only included if both upper and lower endoscopies were performed within a four month period of each other.

Eighty-five patients were entered into the study; 46 were female. The mean age was 72 years. Significant GI lesions were found in 46 (54%) of the patients. In 22 patients (26%), lesions likely to cause IDA were found during upper endoscopy. These were all benign. Twenty-two patients (26%) were found to have colorectal cancer. Nine patients (11%) had lesions in both the upper and lower GI tracts that could be causing IDA.

Thirty-seven patients (44%) underwent duodenal biopsy and in all of these the histology showed normal duodenal mucosa. \textit{Helicobacter pylori} was checked in 61 patients using either a CLO test or histology. Six of these patients (10%) were found to be \textit{H. pylori}-positive.

Faecal occult blood (FOB) was checked in 36 patients. Of the 11 patients with positive FOB, only 4 had abnormal colonoscopies. Of the 26 patients with a negative FOB, 6 had abnormal colonoscopies. This gives a negative predictive value of 77\% and a positive predictive value of 36\% for a positive FOB.

The presence or absence of upper or lower GI symptoms was not predictive of the nature nor site of pathology found. Neither was the degree of anaemia.

As in studies from other Western countries, significant lower GI pathology is a common finding in investigation for IDA.\cite{5-8} Dual pathology is common. Due to the high incidence of lower GI malignancy in this study and the low known incidence of upper GI malignancy as a cause of IDA it would seem prudent to perform colonoscopy as the initial endoscopic procedure in the investigation of IDA in New Zealand.
References:


Opioid poisoning deaths in New Zealand


As a doctor working in a large methadone service I am concerned at the emphasis that has been put on the prescribing of methadone ‘takeaway’ doses as a risk for opioid poisoning. Those of us who work in methadone treatment services in New Zealand are very mindful of the risks and work hard to enable our clients to receive methadone treatment in a manner that assists them to achieve as normal a life as possible while minimising the risks of diversion. I would like to also point out that methadone is increasingly being prescribed for pain management in the community, and I am aware through my work that some of the methadone for sale illicitly is in tablet form which methadone-maintenance-treatment services do not prescribe.

In addition, I believe that the article was misinformed with regard to the role that morphine prescribed for therapeutic-use plays in drug abuse in the community. Between 1998 and 2004, our Service surveyed all 434 clients coming on to our programme. 360 were using morphine sulphate tablets, 112 used ‘homebake,’ and 173 used other opioids (including illicit methadone, codeine products, poppy tea, etc).

‘Homebake’ has largely been out of favour with opioid-dependent people since morphine sulphate tablets (and now M Eslon) became available. Information obtained from our clients indicates that a proportion of this morphine is obtained from diversion of therapeutically prescribed morphine.

Karla Rix-Trott
Lead Medical Officer
Auckland Methadone Service
Quality use of medicines activities


In late 2003, district health boards (DHBs) collectively set up a “quality and safe use of medicines” (QSUM) group to encourage and foster interest and activity in this area. Pharmac chose to participate within this DHB process rather than continue its QUM strategy in a stand-alone way as suggested by the article. As chair of the QSUM group, it is clear to us that a national strategy is desperately needed. This will help to support and guide localised activity (of which there is plenty). No-one envisages it centralising what is done.

New Zealand is a small country and we can have successful innovation without reinventing the wheel 21 times.

Dwayne Crombie
Chair, QSUM Group, DHBNZ
At last, some good news

In the *Dominion Post* dated March 10, 2005 an article entitled *Board must pay surgeon $10,000* partially restored my faith in common sense and I thought it should be shared with all concerned. It is quite likely many people will be unaware of the tiny article on page 7, or the story behind it. However, I believe it holds great significance for any DHB-employed doctor.

Briefly, the case involved a couple suing a DHB for a failed vasectomy procedure. The DHB settled with the claimant and then expected the doctor concerned to contribute to the settlement. To his credit, the surgeon refused to settle and insisted on going to trial. The doctor was not negligent and the DHB was ordered to reimburse the surgeon’s costs.

This is not the first case of this nature and sadly it will not be the last. The specifics of the case are not as important as the principles involved.

These are the generics. Firstly a patient sues a DHB. (A particular doctor need not even be listed as a defendant in the action). Secondly the DHB settles with the plaintiff. (The doctor, or their insurer, are not involved in the negotiation of the settlement). Finally the DHB’s insurer insists on the doctor and/or their insurer to contribute to the settlement (or even pay the entire settlement amount!).

The arrogance of this demand is based on the fact that DHBs reimburse doctors for their indemnity premiums. They argue that this entitles them to expect your insurer to contribute to their settlement. There appears to an assumption that ‘you have insurance so let them pay.’ Clearly no indemnity insurer can afford to pay out claims indiscriminately and expect to remain viable. By admitting liability, the DHB is also effectively depriving the doctor of many legal avenues of defence.

There is a lesson here for all DHB-employed doctors. I hope the ASMS has taken note of these proceedings. Perhaps we should decline the reimbursement of our indemnity fees if the DHB continues to believe that this entitles them to use our funds for their settlements. Perhaps the DHBs should consider offering their employees medical indemnity as they do in certain states in Australia.

Louis Macpherson
Gynaecologist
Palmerston North
Reviewers for the New Zealand Medical Journal in 2004

The Editorial Board and Editorial Team (Frank Frizelle, Editor; Brennan Edwardes, Production Editor; Sally Bagley, Administrative Assistant) thank all those who generously gave their time and expertise in reviewing papers for the New Zealand Medical Journal in 2004. (We apologise to anyone whose name has been inadvertently omitted from the following list.)

Abel G  Crozier I  Highton J  Menzies O  Sellman D
Ali A  Cunningham W  Hill A  Mercer J  Sharpe N
Allardyce R  Davidson P  Hodgson B  Mercer P  Shaw D
Allen P  Davis A  Horne G  Merrie A  Shaw G
Anderson N  Davis P  Hume-Moir M  Metcall P  Shipton E
Anderson T  de Chalain T  Humm M  Miles C  Simmons D
Ardagh M  Dennett L  Ikram R  Miller R  Sinclair S
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Asher I  Dickson S  Jackson R  Molteno T  Smith G
Austin N  Dijkstra B  jellyman T  Morton J  Smith M
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Beasley R  Elwood M  King B  Parkin P  Surgenor L
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Begg E  Fenshaw J  Kydd R  Patton N  Than M
Bisher A  Fenton A  Kypri K  Paul C  Theis J-C
Bissett I  Findlay M  Langley J  Perez D  Thomas M
Blackmore T  Fink J  Langley S  Pithie A  Thompson-
Blakely A  Firth H  Laugesen M  Pitto R  Fawcett M
Boswell R  Fisher R  Lennon D  Poole G  Thornley C
Bowie D  Fitzharris B  Lethaby A  Poole P  Thruston A
Bramley D  Ford R  Lever N  Porter R  Thyne G
Bridge P  Fountain J  Lim D  Powell D  Tobias M
Briscow T  Fromont C  Lintott C  Pullon S  Todd F
Buckenhut T  Fraser A  Lunt H  Reid I  Toomath R
Burton R  Fraser R  Lynn K  Reid J  Toop L
Burn J  Gane E  MacFarlane M  Reid R  Town I
Burt M  Gardner S  Mackenzie N  Reith D  Watson E
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Cape G  Gibb D  Manning P  Richardson A  Walker W
Chambers S  Gill E  Maseo, K  Richens R  Walmsey R
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Coates J  Goode M  Martin P  Robertson P  Wilkinson T
Coates M  F  Mason D  Robinson B  Wilson Nick
Cohen M  Gow P  McCullagh J  Robothwell A  Wilson Noela
Cohen P  Greig M  McCall J  Rush E  Wong, J
Colls B  McEwan T  McConnell D  Sainsbury R  Windsors, J
Connor J  Grimwood K  McCrystal M  Sanehanger S  Worthington J
Cooke R  Hanger C  McGregor G  Sankaran S  Wynne C
Cormack D  Harman R  McKay J  Scragg R  Wourse L
Cox B  Haynes J  McLeod D  Schlup M  Wong S
Cramer T  Hemmings C  McQueen F  Schwartz P  Womes L
Croucher M  Heslop J  Meates-Dennis M  Scrapp R  Woods L

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Dyspepsia (2nd edition): Fast Facts Series


The introduction begins with “Dyspepsia defies precise definition”—a very realistic basis to begin a review of this complex topic. Later in the book, the authors state that dyspepsia literally means bad digestion. The authors grapple to encompass the many organic and functional disorders that result in dyspepsia.

Amongst the many patients presenting with self-limiting and functional dyspepsia will be a subset with more serious underlying pathologies. A table of the alarm symptoms, anaemia, dysphagia, weight loss, bleeding, and persistent vomiting is included in the first chapter. These are the symptoms that should alert the physician to request urgent investigation.

This book is part of a series entitled “Fast Facts.” It is very concise and easy to read with colour coding of chapters and tables. The chapter topics include: peptic ulceration, Helicobacter pylori, reflux, functional dyspepsia (including tables with suggested drug treatment), and dosages.

The book is disease-based, so looking up a common dyspeptic symptom (such as nausea) requires searching multiple chapters and pages. Overall, this is a well set out, easy to read account of dyspepsia—one of the most common presenting symptoms to general practitioners.

Bruce Chapman
Gastroenterologist
Christchurch Hospital
So Old So Quick


This book is easy and rewarding to read. The author has the facility to divert from the main theme and return without loss of continuity. It is indeed the autobiography of Pat Moore, but by virtue of his long life and career, it covers many eras, events, and developments. Initially I wondered about his remarkable memory and powers of recall. However with his description of “Algy” and Newk” at Selwyn College, which I found penetratingly accurate, I am reassured.

Initially there is a delightful description of an untroubled boyhood between the wars. This is followed by his time studying medicine in Dunedin and then suddenly being “dropped in the deep end” as a house surgeon in Auckland. He graphically describes his time as R.M.O. to the Maori Battalion in Italy. He highlights again the need for New Zealand graduates wishing to do postgraduate study to go overseas, often to London. This he did. How that has changed with our own postgraduate training and qualifying programmes.

He has been in the forefront of his own developing speciality. The whole story is told with a lively turn of humour. I could have wished for more of his whimsical illustrations.

The book is an informative background to the health upheavals of the last two to three decades. I can vouch for the accuracy—I was a contemporary in Dunedin and Selwyn College, and I knew many colleagues and lecturers.

Pat Cotter
Retired Surgeon (involved in the Medical History Trust)
Christchurch