



THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

Department of Accounting

Working Paper Series

**Redesigning Clinical Laboratory
Services: Securing Efficient
Diagnoses for New Zealanders**

by

**Necia France, Graham Francis and
Stewart Lawrence**

Number 76

January 2003

MANAGEMENT SCHOOL

Te Raupapa

The *Working Paper Series* is published by the Department of Accounting, University of Waikato, and is intended to provide staff, visitors and postgraduate students with a forum for publishing developing research. The opinions expressed in the various papers in the Series are those of the author(s) and are not necessarily endorsed by the Department. Working Papers are preliminary in nature; their purpose is to stimulate discussion and comment, and any feedback from readers would be welcomed by the author(s).

Correspondence concerning the submission of manuscripts and the receipt of copy may be addressed to:

The Editor - Working Paper Series
Department of Accounting
University of Waikato
Private Bag 3105
Hamilton, New Zealand
Fax: 0064 (0)7 838 4332

Correspondence concerning the reproduction of, or comment on, any part of a Paper should be addressed to the author(s) concerned.

ISSN 1173-7182

**REDESIGNING CLINICAL LABORATORY
SERVICES: SECURING EFFICIENT
DIAGNOSES FOR NEW ZEALANDERS**

Necia France

Graham Francis

Stewart Lawrence

Accounting Department, Waikato Management School, University of
Waikato, New Zealand.

Executive Summary

This monograph develops an evidence-based redesign plan for a key support service in the country's health system. It is based on a doctoral thesis that evaluated the impact of market-style health resource control on New Zealand's clinical laboratory services. The monograph summarises material detailed in the thesis, and extrapolates from it to make the following recommendations for improved cost-efficiency:

- Competitive contracting as a means of price control for diagnostic laboratory services should be abandoned.**
- Laboratory remuneration should be cost-based and independent of specimen origin.**
- Costing methodology already developed and tested in Australia should be introduced here in order to define remuneration formulae.**
- A Laboratory Services Advisory Committee, representative of clinical laboratories in both sectors, should provide service-related advice to the Ministry of Health.**
- Regionally representative laboratory committees should be charged with planning and co-ordinating district laboratory services, in the interests of cost-efficiency.**
- Interactive electronic expert systems should be developed in major regional laboratories as a counter to clinical laboratory misuse.**
- Technology retraining programmes aimed at achieving suitable medical laboratory technologist redeployment within the health system should be instated in main centres. Long-term, providers of workforce training should aim at developing greater flexibility in the health technology workforce.**

Redesigning Clinical Laboratory Services: securing efficient diagnoses for New Zealanders

“The quest for the perfect organisational arrangement has an equivalence in the 15th century philosophers’ search for the stone of knowledge: it is fascinating, largely irrelevant, and never, by definition, achievable. It is a diversion of enormous proportions which obscures the necessity to get on with the real job of design and redesign.”
(Warner, 1997, p12).

In the above quotation, Warner promotes a concept of *design*, for which ‘ends’ both dominate and define ‘means’, over one of *organisation*, which is wholly concerned with ‘means’.

The role of laboratories in providing clinical decision support has become increasingly important for fully effective health care. In the United States, for example, where half of all clinical laboratory tests are performed in a community hospital setting, laboratory services, at less than five percent of the total hospital budget, have been estimated to leverage 60-70 percent of all critical decision-making (Forsman, 1996). Changes that impact on clinical laboratory services, therefore, have the potential to resound throughout a public health service in highly significant ways. Despite the clinical laboratory’s pivotal role in the health system, it has received minimal design input from policy-makers in New Zealand since its inception in the early 1940s.

This monograph is based on a doctoral thesis that evaluated the impact of the 1990s health system restructuring on New Zealand’s diagnostic laboratory services (France, 2001). The restructuring, or ‘reform’, was innovative in that it created a health market of providers competing for taxpayer funding on price, primarily as a means of state expenditure control. In the thesis this approach was analysed for its success in securing more cost-efficient laboratory diagnoses for New Zealanders.

Four broad phases formed the framework of the evaluation (Guba and Lincoln, 1989; Laughlin and Broadbent, 1996). These were (i) the identification of ‘stakeholders’ and their ‘claims, concerns and issues’; (ii) the exposure of stakeholder circles to all possibly-relevant information available; (iii) a further gathering, or uncovering, of

information focussing upon unresolved conflict; and (iv) an attempt at reaching a consensus view.

A wide range of relevant archival published and unpublished material of both primary and secondary origin was available for collection. Such material included newspaper articles and research reports, official strategy documents and reviews, letters and electronic mail in reply to requests for information, Internet accessible sites, internal health organisation reports, and Official Inquiry transcripts. Personal correspondence (letters and electronic mail), and interview notes or transcripts also yielded much valuable data.

In addition, several databases were available for access. These contained longitudinal information, through the period of interest, for monitoring:

- community laboratory utilisation: test volumes, expenditure on tests, and test mix by test type and health authority region (Health Benefits Limited);
- general practice laboratory referral patterns (Royal New Zealand College of General Practice Research Unit databases);
- anonymous test result details, i.e. total volumes and total numbers of 'abnormalities' detected for selected test types (Hamilton community laboratories);
- avoidable, or 'ambulatory-sensitive', public hospitalisations by age grouping, ethnicity (Maori/non-Maori) and gender (New Zealand Health Information Service);
- key financial and quality performance indicators (Health Waikato Laboratory).

All of the above were used to collect both exploratory material and reinforcing/dissenting evidence.

On balance, the evidence supported the view that the core restructuring failed to achieve improved cost efficiency and that it exacerbated weaknesses already present from the inception of the laboratory service, throwing longstanding design faults into sharp relief.

This monograph summarises the evidence gathered, and points to features of design that should be addressed in the future if waste of scarce health care resources is to be avoided and early laboratory diagnoses made efficiently. It is organised around a series of questions central to the theme of design and redesign.

1. What are the features of New Zealand's diagnostic laboratory service?

2. How did the 1990s policy changes attempt cost-efficiency gains?

3. What happened in the laboratory arena through the 1990s?

4. How did features of the total environment influence outcomes?

5. How can the service be improved?

1. *What are the features of New Zealand's diagnostic laboratory service?*

Diagnostic laboratory services in New Zealand have been state funded since the inception of the Social Security Regulations (Laboratory Diagnostic Services) introduced in 1946. Traditionally, community (privately owned) laboratories, which serviced the primary sector, performed only the higher-volume tests. These were, and still are, fully reimbursable by the state on a fee-for-test basis using a pre-negotiated schedule of fees, the 'primary-referred schedule'. Hospital laboratories performed a wider range of tests, including specialised tests for the primary sector, private hospitals and specialists. Until 1964, hospital laboratories were reimbursed in the same way as private laboratories, but since then, have been funded from global hospital budgets through a bulk allocation based retrospectively on past expenditure.

The only official examination of the *design* of New Zealand's clinical diagnostic laboratory system took place almost 30 years ago with the New Zealand Board of Health Report: 'Clinical and Public Health Laboratory Services' (1974), which resulted from a Committee of Inquiry into the country's clinical laboratory services. This Committee held its first meeting in March 1971 at the height of what has been termed the 'cottage industry' phase of medical practice (Conn and Snyder, 1997). The Committee comprised a representative range of senior health department and laboratory professionals. At this time clinical laboratories were relatively small-scale, labour intensive and, whether publicly or privately owned, catered to a localised 'captive' clientele, defined by sector of medical care (public/ private). A central Laboratory Services Advisory Committee, made up of two pathologists in private practice (one also with a part-time hospital appointment), a hospital pathologist, and an academic pathologist made annual adjustments to the 'Schedule of Tests and Payments' and advised the Department of Health on the recognition of pathologists.

By the early 1970s, almost a third of the 95 pathologists in practice in New Zealand divided their time between public hospitals and private

laboratories (NZ Board of Health, 1974). Medical laboratory technologists made up the largest group of clinical laboratory professionals; receiving tertiary and on-the-job training for their basic three-year training qualification, then two years' specialised laboratory practice. Some postgraduate-level scientists were employed as analysts in public hospital 'special purpose' and research laboratories.

The recommendations resulting from the Committee of Inquiry were very comprehensive. They covered organisation and facilities; between-laboratory relationships and funding; administration, control and planning; staffing and education; and relevant linkages with and within the Health Department. They were aimed primarily at fostering a high-quality service and, in retrospect, assumed a more stable future than subsequent conditions were to deliver. One dominant theme that emerged from their Report remains unresolved after thirty years: **the need for co-ordination of laboratory services in the interests of cost-efficiency**. To this end, widely representative national and regional laboratory services co-ordinating committees were recommended. The Committee of Enquiry also recommended that

“...regional laboratory committees” be instructed to “consider the setting up of regional (possibly national) central pools of expensive automated equipment, which would be available to both private and public sectors” and to “.....standardise reports as far as possible Tests should not be repeated merely because they have been done in another laboratory” (NZ Board of Health Report Series: No 22, 1974, p. 59).

In similar vein, the Committee suggested that:

“Consideration should be given to instituting arrangements whereby private and hospital laboratories contract work to each other, depending on the availability of automated processing and special facilities, as determined by the regional laboratory committees.” (NZ Board of Health Report Series: No 22, 1974, p. 114).

Other recommendations, apparently aimed at curtailing profiteering from the Social Security Fund or (later) Vote Health were:

"The Laboratory Diagnostic Services Benefit to be continued, and adjusted to allow for benefits of increasing laboratory turnover and automated testing" (NZ Board of Health Report Series: No 22, 1974, p. 71).

This recommendation assumes that economies of scale would be passed on to the state, i.e. that the prices on the Schedule would be adjusted to reflect the cost of providing the service, and should fall, therefore, with increasing volumes and automation. A further recommendation was:

"The original application for recognition by a pathologist should contain a declaration that he is entering practice on his own account and will engage in no arrangements with commercial enterprises which would result in their gaining access to Social Security funds..." (NZ Board of Health Report Series: No 22, 1974, p. 105).

Included as an Appendix in the same Report was a commentary on the Committee's findings from Professor Ian Wootton, then Chief Scientist at the British Department of Health and Social Security, and an academic clinical chemist. Wootton drew attention to the dual system of private and public-hospital laboratories - both supported by the state - that was unique to New Zealand at that time. The Report enlarges on his comments, as follows:

"As populations increased and inflationary pressures continued, he foresaw difficulties with the dual system which might well arise when it became necessary to allocate priorities. There was no doubt that, at present, [medical] practitioners were provided with a service that was entirely satisfactory to them. In the future, this service might not necessarily provide the best system for the patient" (NZ Board of Health, 1974, p. 135).

In his History of Pathology in New Zealand (1997), Professor DT Stewart regretted that the 1974 Board of Health Report, which should have been the 'Magna Carta' for pathology services in New Zealand, was effectively 'pigeon-holed' despite protests from the Laboratory Services Advisory Committee of the time.

In the early 1970s, state expenditure on hospital and privately-owned laboratories was divided about equally, and rising at approximately 18 percent per annum, mainly because of increases in test range and throughput (rather than in price per test). A report written for the Department of Health in 1978 by RT Kennedy, then Principal Technologist at Auckland Hospital Laboratories, foreshadowed what were to become recurring themes in the ensuing years. In this report, entitled: "The rising laboratory workload: a critical appraisal of cause and effect", Kennedy apportioned the blame for wasteful laboratory resource usage evenly between laboratory management and medical staff, and made some prescient comments in his summing up:

"Somewhere along the line, sound management has to prevail or local decision-making will be further eroded by an increasing bureaucracy" (Kennedy, 1978, p. 27).

And in relation to medical staff:

"The sad fact is that practices learnt from this [wasteful hospital-based] introduction to laboratory medicine find their way into private medical practice with resulting overuse of the laboratory services once again" (Kennedy, 1978, p. 29).

Throughout the 1970s test automation and computerisation of the total testing process were reducing the need for many traditional laboratory skills and practices, and increasingly cutting across an established laboratory organisation based largely on manual technique groupings. This meant that, within the laboratory, positions at all levels were being simultaneously transformed and reduced in number. A workforce composed largely of technologists, whose training had been narrowly vocational, welcomed neither process. Since most large hospitals in New Zealand were training grounds for an expanding medical workforce, some overuse of the laboratory could be excused as a contribution made to the training of young doctors. More fundamentally, however, Kennedy's recommendations conflicted with the prevailing expansionary culture of the time, and with disincentives to cost-effective practice 'built in' to career structures. Two of Kennedy's (1978) more specific recommendations for controlling waste, illustrate this point:

“Where the cost justification for purchase (of expensive laboratory equipment) is based on a reduction in staff, administrators should see in fact that there is a reduction in staff.” (However, a counter-incentive was in play here: one factor influencing the grading of senior technologists in the public sector was the number of staff they controlled.)

“Proper management of laboratory resources implies that the laboratory administration must have some control over external demands on its services.” (But falling workloads would be detrimental to professional interests and personal careers.)

The increasingly anachronistic duplication of the service, and the failure of its dual sectors to co-operate over future requirements were possible underlying drivers of the behaviour cited. It is unfortunate that, as one consequence of failure to address Kennedy’s concerns, clinical laboratory services were to become an obvious target for the 1990s ‘New Public Management’ cost efficiency measures.

Malcolm (1993) has analysed longitudinal trends in New Zealand primary medical care-related services and expenditure over the decade 1982/83 to 1992/93. Growth in expenditure on total primary care-related services exceeding inflation had occurred over most of this period, and Malcolm’s analysis attributes most of this to increased utilisation of the primary care support services (pharmaceuticals, laboratory and maternity services) rather than to increased general practitioner utilisation. Discrepant evidence exists, however, regarding the part played by the following factors in increasing clinical laboratory utilisation per capita up to 1993:

- increased GP availability
- increasing overuse by doctors
- increasing use of a larger repertoire of tests
- increased subsidisation of certain social groups (with the introduction of GMS targeting in 1991)
- improved access to collection services
- proliferation of laboratories (in the lead-up to competitive tendering for state funding signalled in 1991)

Meanwhile, continuing developments in expensive, imported laboratory analytical technology reinforced the need for rationalisation and co-ordination of available clinical laboratory resources.

In summary, perverse incentives embedded in the development of New Zealand's diagnostic laboratory system made it a prime target for the 1990s restructuring. These included:

- third party payment, and demand mediated through other professionals, rather than patient initiated
- a dual system of publicly and privately owned laboratory services, both state funded, duplicating expensive equipment, materials and staff structures
- professional incomes and career structures strongly influenced by service volumes.

2. How did the 1990s policy changes attempt cost-efficiency gains?

Critical structural changes were introduced to the New Zealand public health sector in the early 1990s and many of these remain, with minor modifications, to the time of writing (late 2002). None of these changes challenged design faults in the country's diagnostic laboratory service, however.

Competitive market mechanisms in combination with delegated decision-making were at the centre of the structural changes applied throughout most areas of the state sector through the 1980s. Both mechanisms were applied to the health system in 1993 and had important implications for clinical laboratories.

Changes in 1991 had included an increase to the level of state general medical services (GMS) subsidies¹ for low-income patients and the removal of GMS subsidies for all other patients. Laboratory tests, however, unlike pharmaceuticals, remained free of charge to all.

Central to the 1993 New Zealand public health sector reforms was a new structure with clearly separated functions for the purchasers (four regional health authorities, RHAs) and the providers of health services. The new structure and its rationale were outlined by the then Minister of Health (Upton, 1991). The expressed aims of the health sector restructuring were:

- equity of access, affordability for all New Zealanders,
- efficiency, flexibility, innovation,
- reduced waiting times,
- widened consumer choice,

¹ New Zealand general practitioners have retained the right to charge fees in addition to the state subsidy, i.e. they remain, with some recent exceptions, in the private sector.

- enhanced working environment for health professionals,
- improved health promotion,
- increased sensitivity and responsiveness.

Significantly, Upton (1991) also cited New Zealand's deteriorating economic position as a precipitating factor for the reforms, along with changing demographics, new technology, and higher consumer expectations.

Supply-side controls on health expenditure (of which the creation of market conditions is one example) are considered to be more effective than demand-side strategies, like part charging or general practitioner bulk funding. Supply side controls include a number of strategies such as direct, centralised controls on levels of remuneration, prices, fees or charges, medical practice, medical manpower, and expensive, duplicated technology usage. None of these interventionist controls, however, were part of the 1990s reforms. Competition for state funded laboratory services contracts was promoted because it

“can reveal the lowest price that bidders are willing to accept – that essential but highly elusive information needed by fee administrators” (Health Funding Authority, 1999 Laboratory Services Strategy, p. 24).

Competition for laboratory service contracts was directed at reducing test prices. Further changes in their wake were directed towards a perceived overuse of laboratories. Primary care efficiency was to be optimised by replacing the individual 'fee-for-service' general medical services (GMS) state subsidy by one of a number of 'bulk-funded' systems generically termed 'managed care': defined as the provision and co-ordination of health care for a registered population, from a primary care level, within an agreed budget (Malcolm, 1996). Independent Practitioner Associations (IPAs) are groupings of general practitioners (GPs) servicing a geographical locality, and sharing a common administrative structure. Throughout the second half of the 1990s, New Zealand's Health Authorities developed contracts for IPAs that allowed them the internal control of budgets for laboratory services (and pharmaceutical subsidies), with the aim of optimising the health benefits achieved for their patients overall.

The rate of uptake of budget-holding contracts varied between regions, but was most rapid in the North Health² region (Ministry of Health, 1997, 1998). Between June 1994 and June 1995 the proportion of the country's GPs involved in IPAs had risen from (approximately) seven percent to 30 percent (Ministry of Health, 1997). By late 1998, the proportion had increased to more than 70 percent, and by late 1999 was estimated at 'near' 80 percent (Malcolm, Wright and Barnett, 1999).

Managed care approaches, like laboratory budget holding, are driven by the need for third party payers to control expenditure. They can risk under-utilising, or misusing, support services unless clear 'best practice' guidelines are in place. For a discipline changing as rapidly as clinical laboratory science, the development of such guidelines requires specialist input. Despite this obvious requirement, the former central health funding authority recommended in 1999 that a generalist Laboratory Services Advisory Group, whose members had no 'personal stake' in either a private or Hospital Health Services (HHS) laboratory, should guide decisions on the range of tests to be funded by the state. The funding authority also released a Request for Proposals to provide best practice education to primary referrers. In this, and associated documentation, a 'conflict of interest' was defined in such a way as to severely limit the participation of practising pathology specialists in test usage education. Thus, an unfortunate corollary of the marketisation of laboratory services was the exclusion of expert specialist input into IPA guidelines, and the technological updating necessary for patient safety (France, Lawrence and Smith, 2001).

One further policy initiative introduced in mid-1997 during the term of the National-New Zealand First coalition government was the free child health care scheme (FCHCS). This scheme raised the general practice subsidy for all children aged under-six-years to a level calculated to completely cover the cost of most GP consultations.

Through the 1990s the traditional roles of public and private laboratories became blurred. Hospital pathology laboratories are now actively seeking private sector fee-for-service testing (both 'specialised' and 'non-specialised'). Private pathologists are also actively seeking to incorporate into the fee schedule many of the specialised tests traditionally performed in hospital laboratories. It

² For location of New Zealand Health Authority regions and cities mentioned, refer Appendix .

appears likely that most of these specialised tests would be sent for analysis to the large laboratory in Sydney, Australia, owned by a company that also owns the majority of New Zealand private laboratories: Sonic Healthcare (personal communication, hospital-based pathologist, 2001). Hospital laboratories have become dependent on private sector-sourced specimens to generate revenue, maintain standards, and justify their own test repertoire and staffing levels.

In 2000, the Labour-Alliance coalition government, elected in late 1999 introduced further structural changes, touted as marking a departure from the competitive model of health service provision, to the New Zealand health sector. Twenty-one district health boards, with largely elected membership, assumed many of the functions of the former health authorities. While some aspects of the 1999 laboratory services proposals were modified following protests from pathologists, a co-operative approach to governance did not extend to the country's clinical diagnostic laboratories. A Commerce Commission decision in 2002 allowing a further private laboratory service provider into the Auckland market suggests that a non-competitive approach to the control of state expenditure on laboratory tests is not high on the official agenda. The competitive model for cost control assumed by the 1999 Laboratory Services Strategy document, remains substantially in place.

In summary, the introduction of competitive market conditions into the New Zealand health sector in 1993 was primarily a means of state expenditure control, and one that required minimal design input from laboratory professionals or from policy analysts. Further devolution of the control of laboratory services occurred with the inception of GP laboratory budget holding. Again laboratory professional input was marginalised.

3. *What happened in the laboratory arena through the 1990s?*

Adverse effects from the spread of managed care in what was an already highly commercialised American health market were summarised by a New Zealand laboratory manager in 1996, as follows:

“Managed care in the USA resulted in ...reduced volume of tests, reduced screening...increased use of large reference laboratories...increased alleged unethical/illegal laboratory practice and ordering behaviour.... The outcome of the changes has been reduced service, access and profitability. There is a reduction in training and research and development, and a glut of available pathologists/ technologists.... In this environment, economies of scale are paramount. Implosion of laboratories has resulted along with dramatic price reduction” (Pratt, 1996, p.14).

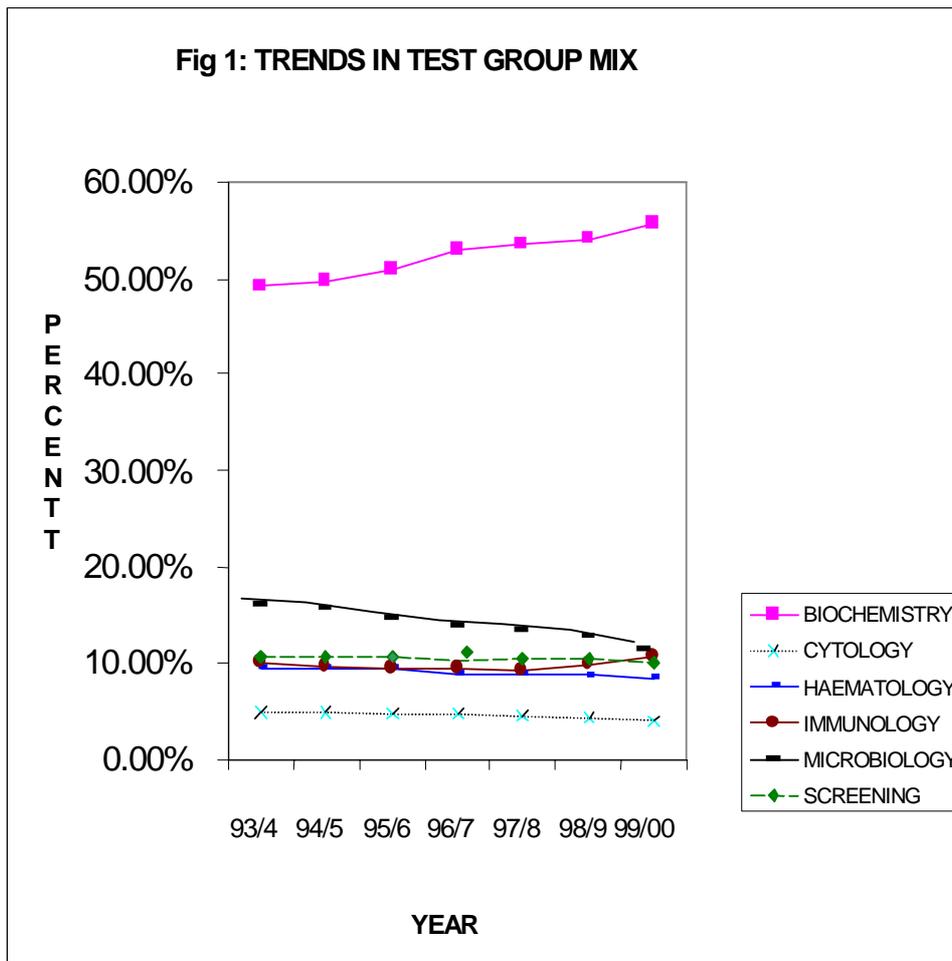
For New Zealand laboratories, the advent of inter-laboratory competition and ‘managed care’ gave outcomes different from those described above: in some areas, markedly so. Most significantly, for the expenditure containment objectives of the reforms, test volumes increased at an average annual rate of almost five percent right through the 1990s, and inflation-adjusted state expenditure on laboratory testing paralleled this increase.

Changes relevant to the financial and clinical performance of New Zealand’s diagnostic laboratories have been monitored in tandem with the major policy changes of the 1990s (France, 2001), and are summarised below.

3A: Changes to test volumes

Many factors have influenced the volumes of tests analysed at state expense.

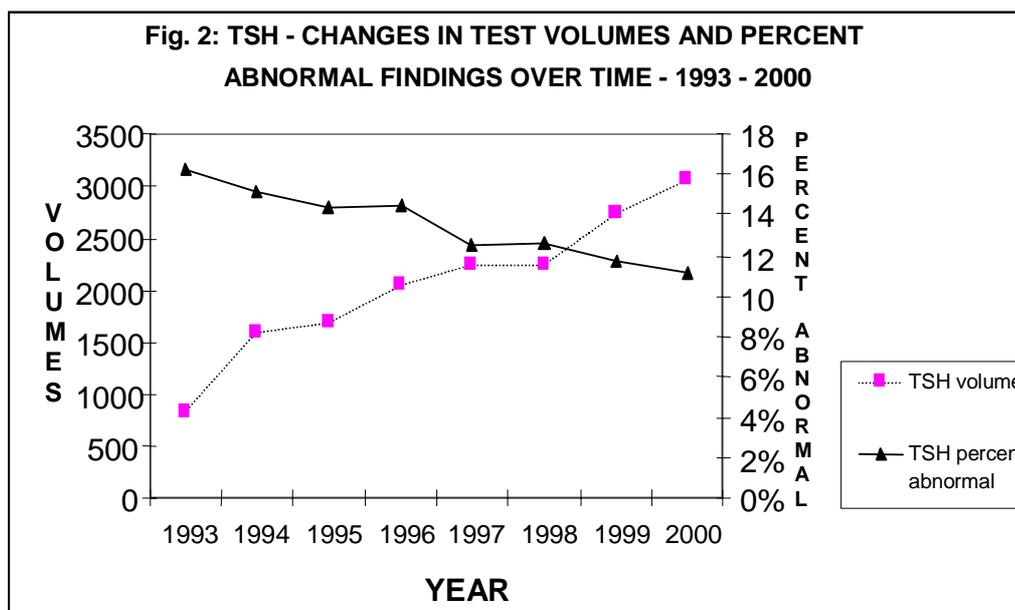
Test volumes and test mix: Overall, test volumes increased 28.9 percent over the period mid-1993 to mid-2000. Of the six major test groupings, the 'biochemistry' grouping increased in volume from 49.1 percent to 55.6 percent, over the 7-year period. Absolute numbers of all test-groups with the exception of those in the microbiology grouping increased.



Test volumes and GP diagnostic efficiency: One objective of the Health Authorities' primary health care IPA budget holding initiative was to improve the quality of laboratory utilisation. Percent abnormal (percent positive or case-finding) rates have been suggested as potential indicators of quality in primary care (Malcolm, Wright, Seers, et al., 2000) and of GP discrimination, or diagnostic efficiency in laboratory use (Sinclair, 1998).

Over the period 1994 to 2000, 10 high-throughput tests performed in Hamilton community laboratories were monitored for changes in the percent abnormal rate. Test volumes were found to have increased in total by an average of 19,209 tests, or approx. 7.7 percent, per annum. This rate of mean annual increase masked a wide variation between the individual tests from 1.3 percent per annum for serum vitamin B12, to 17.6 percent per annum for serum glucose.

Some temporary falloff in the rate of test volume growth was detected between 1996 and 1998, consistent with Midland-regional and national trends recorded below, and associated with demand control measures. Using the group of tests monitored in this study, Hamilton area-GPs detected more abnormalities per year as the decade progressed in both undiagnosed and treated patients. There was little evidence, however, of improved GP discrimination in test ordering associated with the institution of IPA laboratory budget holding. The 'percent abnormal' C-reactive protein (CRP) tests reported did improve over the decade, but CRP is a relatively new test with which GPs were gaining experience. Each thyroid stimulating hormone (TSH), cholesterol and glucose abnormality detected was costing more in terms of 'negative' test results as the decade progressed, i.e. diagnostic efficiency, or 'quality of laboratory utilisation', to use the terminology of Malcolm, Wright, Seers et al. (2000), diminished for these three tests.

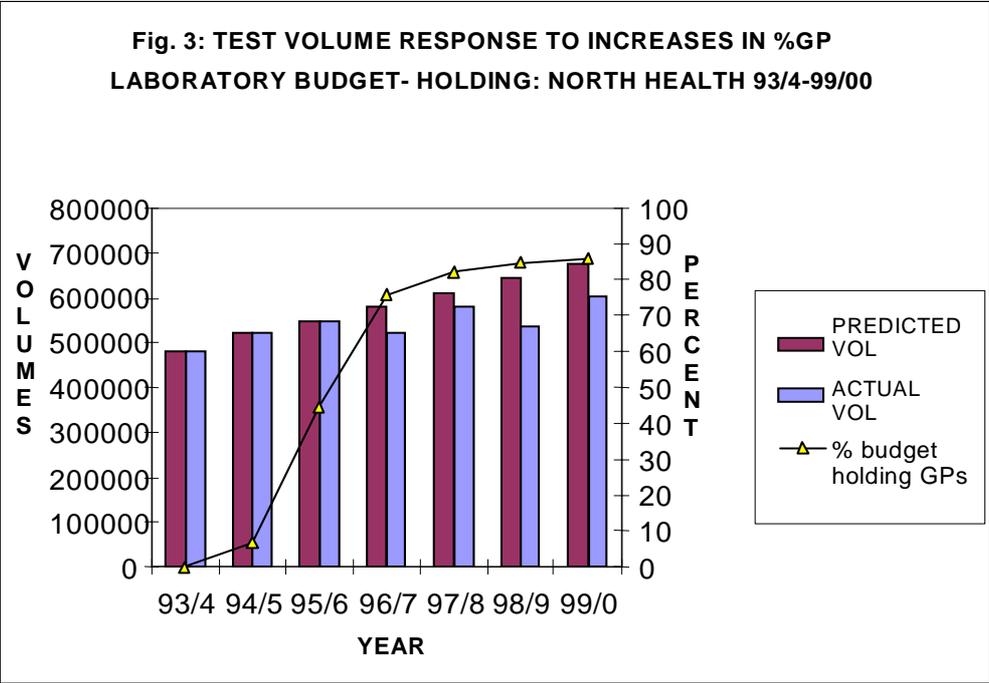


Test volumes and population growth. For New Zealand as a whole, the average rate of increase in test volumes throughout the mid-93 to mid-00 time span, year-on-year, was 4.66 percent. Population growth rates between the 1991 and the 1996 census can be derived from data given in Bedford and Goodwin (1997). The annualised percent growth in the New Zealand population was 1.41 percent, i.e. less than a third the rate of test growth. Rates of test volume increase were found to be higher for the Tauranga laboratory area than for that of the combined Hamilton laboratories. From data given by Bedford and Goodwin (1997), it can be calculated that the two cities' annual growth rates between 1991 and 1996 were: Greater Hamilton, 1.59 percent per annum and Tauranga, 3.30 percent per annum.

Test volumes and the GP workforce: Data obtained by the Medical Council (NZHIS, 2001) indicated that over the period 1991-97 the number of GPs practising in New Zealand increased by 22.3 percent. This is an average annual increase of 3.42 percent per annum, i.e. somewhat less than the average annual increase in test volumes of 4.66 percent recorded above, but still more than double the rate of population increase. The period from 1993 to 1997 was a time of particularly rapid growth in the GP workforce.

Between 1980 and 2000, the GP workforce changed with respect to gender: from 12.6 percent female in 1980, to 36.8 percent female in 2000. Immigration policy had favoured medically and technically qualified candidates for permanent entry into New Zealand up until the formation of the National-New Zealand First coalition government in late 1996. By 1998, 33.7 percent of doctors working in New Zealand had qualified overseas (NZHIS, 2001).

Test volumes and demand control policy: Although test volumes increased throughout the period monitored, rates of increase varied between Health Authority regions. From the year in which the percentage of GPs in budget-holding contracts exceeded fifty percent, and for two further years, the rate of test volume growth slowed noticeably in the North Health and Southern regions (and, to a much lesser extent, in the country as a whole).



Test volumes and GP referral rates: Estimates of ‘GP encounters utilising laboratory tests’ were made for three health-financial years (1995/96, 97/98 and 98/99) to gauge the impact of government policy initiatives on GP laboratory referral rates and patterns. Data were extracted from the RNZCGP Research Unit databases in Dunedin. The percentage of general practice encounters utilising laboratory tests in the ‘baseline’ (1995/6) sample, was 12.4 percent. By 1997/98 the percentage of general practice encounters utilising lab tests had fallen in the same six practices monitored in this study to 9.2 percent. However, the following year, 1998/99, showed an increase to 11.4 percent. These year-on-year changes were all statistically significant.

In 1995/96, the patient encounter rate was 2.55 per registered patient. Between 1995/96 and 1997/98, the practices monitored saw a statistically significant reduction in the GP-patient encounter rate (from 2.55 to 2.28 per registered patient). This overall 10.6 percent decline affected non-Community Service Card (CSC)-holders (17.2 percent decline) much more than CSC holders (3.6 percent decline).

Test volumes and GP referrals by demographic group: Increased clinical service usage may be associated with demographic shifts. Again using data extracted from the RNZCGP Research Unit

databases in Dunedin, GP laboratory referrals were analysed by gender, income group, age group and usage need.

The composition of the registered patient populations from which the consultations were drawn changed only slightly throughout the period sampled. The most notable change was an increase in the percentage of Income group 1 (Community Service Card holders) from 27.2 percent in 1995/96 to 31.0 percent in 1997/98 and 31.5 percent in 1998/99. (The threshold for CSC eligibility was raised in mid-1996.) The proportion of High User Cardholders also increased over this period, from 0.3 percent to 1.3 percent, of the registered population.

By comparison with their representation in the registered patient population, females had a high encounter rate, and their encounters utilised lab tests even more than predicted from the encounter rate. This pattern became significantly less marked, however, through the four years monitored. The fall might reflect parallel changes in birth and fertility rates, which were lower in 1997/98 than in 1995/96, the 'tail-end' of a 'blip' in fertility that peaked in 1990 (Pool, 1999).

Income group 1 (IG 1, CSC holders) was over-represented in the 'encountered' population, and their lab utilisation reflected this. The over-representation of IG 1 in 1997/98 and 1998/99 was even more marked than in 1995/96. By 1998/99, low income-group patients had reached approx. 54 and 53 percent of the encountered and tested populations (c.f. 31.5 percent of the registered population). Further analysis in this study revealed a statistically significant decline in the encounter rate for this group from 4.62 encounters per registered patient in 1995/96 to 4.46 encounters per registered patient in 1997/98, mirroring the declining overall encounter rate already noted.

GMS group A (adults aged 16 to 64) had fewer GP encounters than expected from their incidence in the registered population. However, their encounters were more likely to involve laboratory tests than their encounter rate would predict, especially by 1998/99, when an increase in the proportion of GMS group A undergoing testing reached statistical significance.

In all three years sampled, the GMS group J ('juniors' aged 5-15 years) GP encounter rate was low, and their encounters were even less likely than predicted to involve laboratory tests.

GMS group P (pensioners) continued, throughout the years sampled, to be both encountered and tested at almost twice the rate expected from their representation in the registered population.

GMS group Y (young children aged under 5 years) also continued, over the 4-year study period, to have GP encounters at almost twice the rate expected from their representation in the registered population, but their laboratory utilisation rates were relatively low. The FCHCS for under six-year-olds initiative was introduced in mid-1997, and statistically significant increases over the 1995/6 encounter-rate for the under-5-years GMS group were detectable by 1997/98 (3.80 to 4.26 encounters per registered patient under-5-years, a 12.1 percent increase). This increase was also reflected in the numbers and proportions undergoing testing, and was sustained for at least a further year.

GP-patient encounter and laboratory utilisation rates were more than 3 times higher for high user card (HUC) holders, compared with their representation in the registered patient population throughout the study period.

In summary, major factors that contributed to test volume increases appeared to be:

- increasing availability of GPs
- population growth
- demographic shifts, especially those associated with lowered income
- improved test availability and range

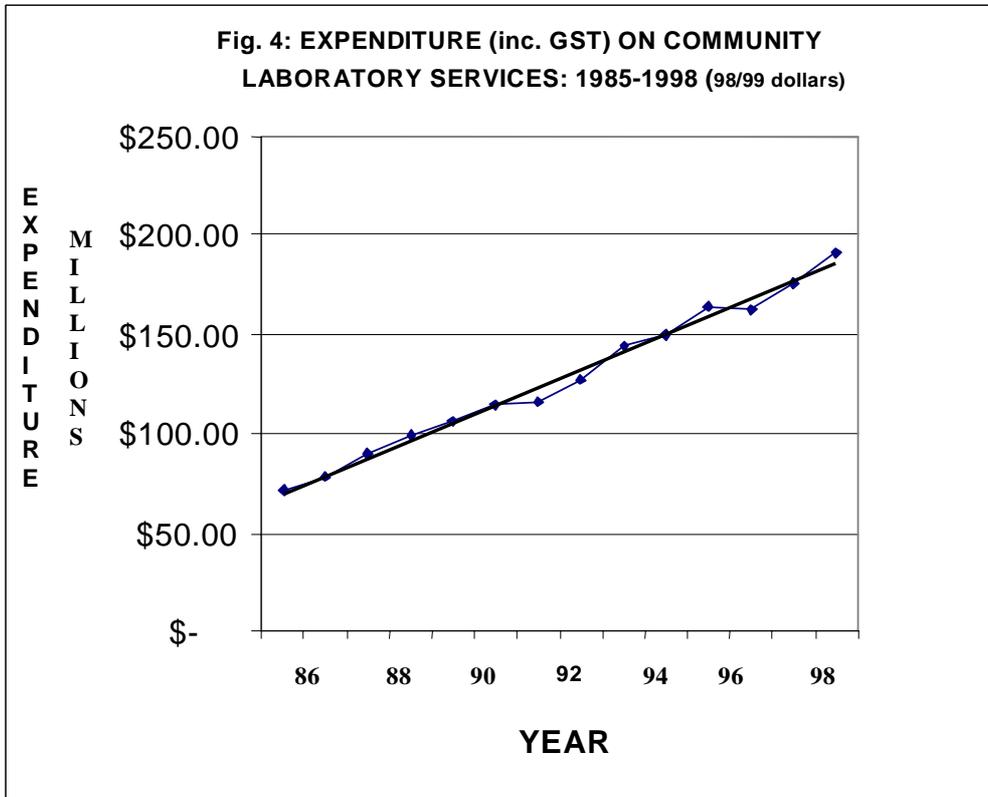
Opposing these drivers, to a limited and regionally variable extent, were

- falls in the GP-patient encounter rate probably resulting from GMS subsidy targeting, and
- the GP laboratory budget-holding initiative.

3B: Changes to state expenditure on laboratory diagnoses

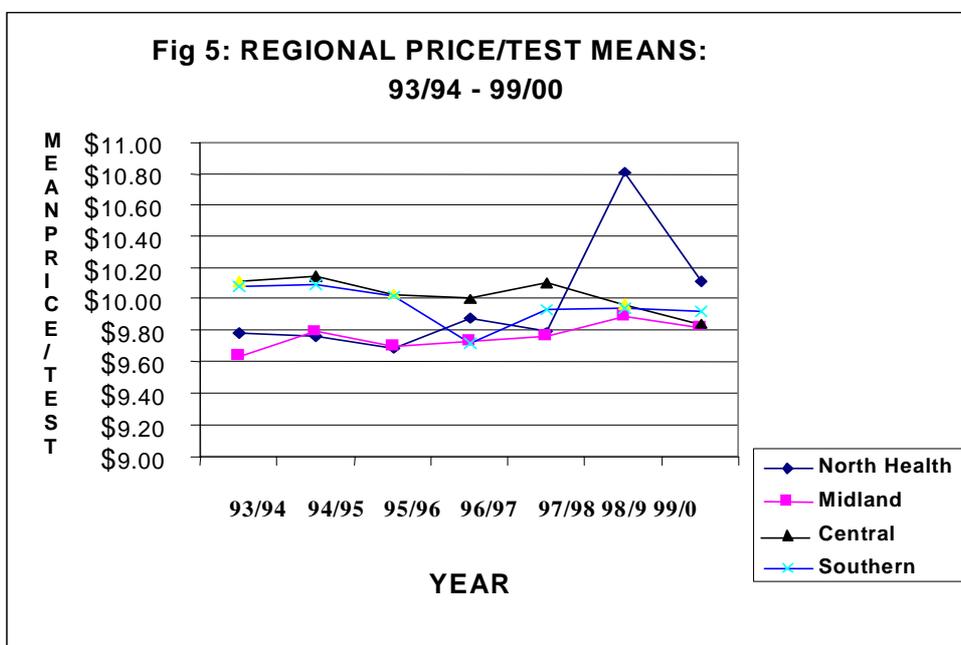
Competition for state contracts was expected to drive price reductions in the primary-referred testing sector. For most of the period monitored, however, prices remained stable and expenditure closely paralleled the test volume data. The following findings underline this observation:

- Overall expenditure on primary-referred laboratory testing had risen markedly from \$89.1 million in 1990/91 (Upton, 1991) to \$140.7 million by 1996/97 (Ministry of Health, 1998). The 3-year expenditure growth rate of 18.39 percent exceeded those for both the GMS (8.51 percent) and pharmaceuticals (16.44 percent). By 1998/99, the HFA was spending \$167 million p.a. on laboratory testing in the primary sector, and estimated that costs were increasing at 5 percent per annum 'with no clear evidence of health gain'. The HFA also estimated that hospital in- and outpatient Laboratory Services, some sub-contracted to privately controlled laboratories, were costing a further estimated \$180-200 million (Health Funding Authority, 1999).
- The Ministry of Health (2000) has published data on the trends in total state expenditure on community laboratories in real 1998/99 dollars (inclusive of GST) for the period 1985/86–1998/99. Two periods of reduced expenditure growth can be discerned in this data, both of which coincide with policy changes: the introduction of GMS targeting in 1991, and the achievement of the 50 percent budget-holding GP threshold, nationally, by the end of the 1996/97 year. The first expenditure slowdown is explicable as an outcome of the falloff in GP-patient encounter rate in 1991/92 noted by Davis, Gribben, Lay Yee and McAvoy (1994) with the introduction of GMS targeting. The second also appears to have been volume and demand-associated, from evidence presented here.
- Both periods of slowdown in expenditure growth were followed by 'catch-up' years involving test price increases. Malcolm (1993) documented the first increase, which preceded the introduction of competitive tendering. A major factor in the second 'catch-up' of 1998/99 was the 10.3 percent rise in mean price-per-test for the large North Health region.



- A 6.5 percent mean price-per-test decrease in the North Health region (and a compensating increase in test volumes) followed the administrative amalgamation of two large Auckland laboratories in the following year (1999/2000). The price changes suggest that amalgamation had enabled efficiency improvements. There is no evidence, however, that market discipline was a factor in the region's price movements, nor in the country as a whole.
- On examination of the national volume and expenditure trend data, it can be estimated that most (at least 92 percent) of the annual average increase in laboratory expenditure of approx. \$5.6 million is accounted for by the underlying test volume increases (approx. 516,000 per year). The small upward drift in mean price-per-test, which is the net of shifts in test mix as well as movements in individual test prices, accounts for the remainder.

- Over the last three years monitored, exposure to deteriorating New Zealand dollar exchange rates produced marked increases in the costs of imported laboratory materials and instrumentation. Salary and rental increases would also have inflated provider costs over the whole period. The convergence of the four regional means for price-per-test (from \$9.65-\$10.15 in 1993/94 towards their mid-point, \$9.86 in 1998/99) suggests that prices held throughout most of the period, however. Convergence to the *lowest* price would have been consistent with a competitive effect on prices. No evidence of dramatic price undercutting was seen.



In summary, the test price containment shown in the data reported here was influenced only minimally, if at all, by marketisation. Price containment owed more to economies of scale that occurred, not by the physical consolidation of laboratories, but by increased test volumes generated in the primary/private sector. A disproportionate increase in automated tests with high marginal returns (like most in the biochemistry grouping) was a feature of the changing test mix. This shift, however, was occurring prior to the establishment of a health services market.

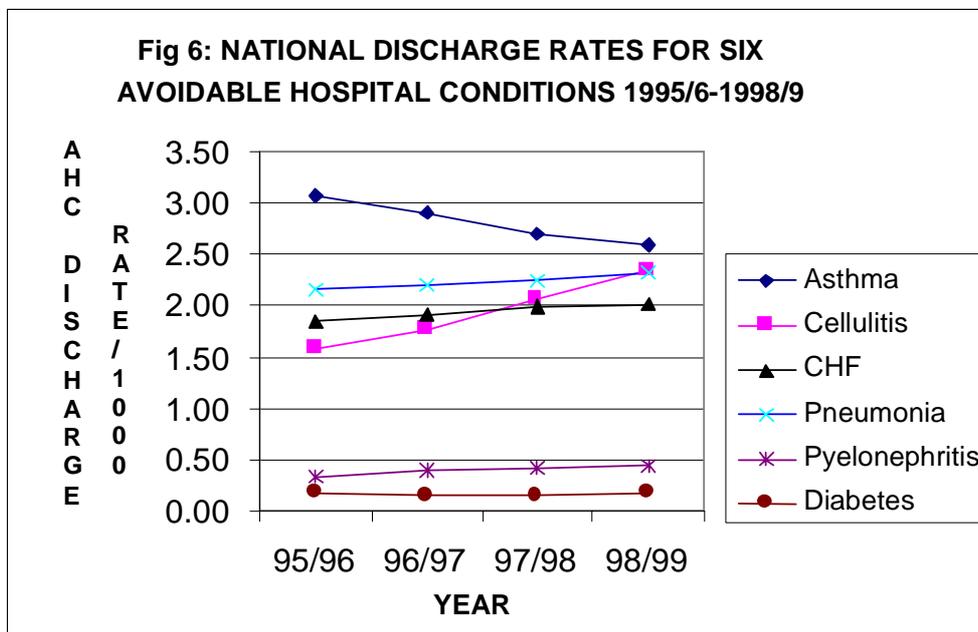
3C: Changes to the efficiency of laboratory diagnosis: rates of avoidable hospitalisations

Another objective of the 1990s policy changes was improved access for the needy to primary health care, including laboratory diagnosis. However, changes in the volume, composition and expense of laboratory testing do not necessarily equate to changes in access or efficiency. To fully gauge the direction of laboratory efficiency movements, contextual information about concurrent health status should be assessed as well. 'Avoidable hospitalisations' (i.e. hospitalisations for conditions that can often be treated out of hospital or avoided altogether) have been used to measure the quality of total ambulatory care both in this country and in the US (HFA, 1998, Pappas, Hadden, Kozak and Fisher, 1997; Salmond and Crampton, 2000; Weissman, Gatsonis and Epstein, 1992). The diagnostic technologies are crucially important in avoiding disease progression towards the point of secondary or tertiary intervention. Thus, avoidable hospitalisations provide an outcome-based efficiency measure, albeit indirect, of the impact of policy change on clinical laboratory efficiency.

Selected New Zealand hospital discharges were followed from 1995/96 to 1999/2000, in the study reported here. The data were obtained from the NZ Health Information Service, stratified by health authority region, ethnicity (socio-cultural Maori/non-Maori), age group (5 year bands) and gender. The six avoidable hospital conditions (AHCs) chosen for this study fell into the following disease groups (defined by the appropriate ICD-9-CM³ coded DRG classifications, Weissman, Gatsonis and Epstein, 1992): asthma, cellulitis, congestive heart failure (CHF), diabetes, pneumonia and pyelonephritis. Results are summarised below:

- Discharge rates increased nationally for cellulitis, CHF, pneumonia and pyelonephritis, over the four years monitored. Rates for diabetes remained approximately constant. Only those for asthma decreased.

³ ICD-9-CM indicates 'International Classification of Diseases, Ninth Revision, Clinical Modification'.



- Examination of the data after stratification by demographic group (calculated per 1000 of the relevant population from which they are drawn) suggested a less favourable trend in several AHC discharge rates for Maori and, in one case (CHF) for females, relative to the national trend. Chi squared analysis of changing proportions year-on-year was performed to test for statistical significance (Brown and Swanson Beck, 1994). Over the four years monitored the increase seen in the proportion of all Maori CHF avoidable hospitalisations was found to be statistically significant (but that of all females insignificant). An increased proportion of Maori avoidable diabetes hospitalisations was also found to be statistically significant over the same time span.

- A high proportion of AHC discharges for asthma and pneumonia were for infants in the under five-year age group. Consequently, trends in these discharge rates by ethnicity (Maori/non-Maori) were followed for the under-five year age group separately. The greatest improvement in asthma avoidable hospitalisation rates was for non-Maori between 1996/97 and 1997/98, i.e. although the Maori avoidable hospitalisation rate fell, it did so to a lesser extent (the proportion of Maori infant asthma avoidable hospitalisations was found by Chi-square analysis to have increased significantly). The finding

also applied for pneumonia, i.e. the proportion of Maori infant asthma avoidable hospitalisations was found by Chi-square analysis to have increased significantly between 1996/97 and 1997/98. No other statistically significant trends were found.

- Maori age standardised morbidity rates (SMRs) exceeded those for non-Maori across all AHCs, except CHF and diabetes. The Southern region did not show this pattern, however. With the exception of asthma, Maori age standardised morbidity rates in the Southern region were **lower** than the corresponding non-Maori rates. One likely explanation for these results is that at the start of the study in 1995/96 many Maori experiencing cardiovascular disease and diabetic symptoms were accessing neither primary nor secondary services. As the 1990s progressed, however, Maori with symptoms of advanced CHF and diabetes were increasingly encountered by the hospital system. On this interpretation, failure to access secondary as well as primary services would appear to be especially prevalent among Southern Maori across most AHCs examined.

- Midland had the highest regional non-Maori age standardised morbidity rates for congestive heart failure, diabetes and pyelonephritis AHCs, and also the highest regional Maori age standardised morbidity rates for all avoidable hospital conditions monitored except diabetes. Thus, despite greatly increased activity (and state expenditure) in the Greater Hamilton primary sector, it would appear that a substantial, and possibly expanding, section of the Midland community was still not receiving adequate health protection at an early stage in the progression towards life-threatening disease.

In summary, the data for avoidable hospitalisations monitored from 1995/96 to 1999/2000 show an improvement for asthma only, and that improvement was most pronounced among non-Maori. Significant increases in the proportion of Maori avoidable hospitalisations were seen in four of the six AHCs. Maori standardised morbidity rates tended to be relatively high in all except the Southern region. These data indicate that the targeting and laboratory budget-holding regimes, each publicised as protecting needy patients, failed on a key health outcome measure: avoidable hospitalisations, despite steeply increasing laboratory usage.

3D: Changes to laboratory ownership and control

The 1980s had seen striking developments in the sophistication, test range and capacity of automated analysers in clinical laboratories, and in the establishment of computerised systems for tracking and reporting results (Burtis, 1996). New Zealand had not, however, experienced the laboratory amalgamations and consequent job losses experienced elsewhere, particularly in the US. Such 'rationalisations' probably represented the only real opportunity for economies remaining, once automation and computerisation had been fully exploited.

In the lead-up to the 1993 reforms at least two new privately owned laboratories were established (Stewart, 1997). Two large companies came to dominate throughout New Zealand in the period 1990-97: Medlabs, owned by the Societe Generale de Surveillance SA of Switzerland (SGS), and Diagnostics, which was New Zealand-owned. These company investments, however, were in already-existing pathology laboratories, both publicly and privately owned. By 1999, only about one third of private laboratories were pathologist-owned.

In the two years to 1997, the number of individual privately owned clinical laboratories reduced from 23 to 17. Cardinal Community Laboratories, the Christchurch-based Aoraki Corporation initiative, an example of pre-1993 laboratory proliferation, was placed in receivership in August 1996 with debts of more than \$3 million, and later put into liquidation (Christchurch Press, June 10, 1999).

In May 1999, the country's two largest pathology laboratories, Medlab Auckland and Diagnostic Auckland announced their administrative merger in response to a 'squeeze on funding'. The new company became known as Diagnostic Medical Laboratory, but retained its separate operations. Within 12 months, SGS, the international Swiss based company owning the Medlab chain, had sold its 'non core' medical testing holdings, following a 'very bad March year' to a larger company, Sonic Healthcare, based in Australia, but still, reportedly, with SGS links (personal communication, 1999). This gave Sonic Healthcare ownership of 70 percent of the country's privately owned laboratory sector (HFA, 2000). The more recent Commerce Commission decision to allow the New Zealand-based Southern

Community Laboratories access to the Auckland market (and a share in the large Hamilton-based Company, Hamilton Medlab), was presumably motivated by the need to maintain a competitive market environment.

Competition between Crown Health Enterprises (CHEs) was a key part of the competitive model adopted in 1993. As one consequence of the expected competition, hospital laboratories co-operated at a regional level only. The 1993 reforms also allowed individual CHEs to make business decisions about 'contracting out' laboratory services rather than providing them in-house, and several hospital laboratory contracts were taken over by private organisations. By 1998, laboratory contracts for Northland Base, North Shore, Taranaki Base, Palmerston North, Dunedin, and Invercargill Hospitals had been let to private companies. In 2001, five years after inter-hospital competition was officially abandoned, only the laboratory contracts for Northland Base, North Shore and Taranaki Base Hospitals had been relocated in-house.

There were signs by the end of the decade that the Sonic Healthcare-owned laboratory chain was attempting to co-ordinate components of its diagnostic service. Individual laboratories, particularly hospital laboratories, did reduce levels of senior scientific/technological staff. The imposition and maintenance of a competitive market for diagnostic laboratory service provision probably precipitated both of these changes. Neither, however, was necessarily a gain for the New Zealand taxpayer, as remaining sections of this monograph argue.

In summary, the policy changes precipitated marked instability in the New Zealand laboratory service but neither dramatic rationalisations, nor change at the level of service design, occurred.

3E: Changes to pathology occupational control and quality

One theme emerging strongly from interviews undertaken for the evaluation on which this monograph is based was the progressive disenfranchisement of pathologists and other clinical laboratory professionals through the 1990s, and its effect on the quality of services.

Laboratory professionals are particularly vulnerable to changes favouring commercial management techniques. Their dependence on expensive, rapidly evolving technology, the ease with which their services can be codified, and their indirect relationship with patients, all make them an obvious target for external control. Pathologists, traditionally the most autonomous group among clinical laboratory professionals, potentially wield the most political power. Over the last two decades in New Zealand, as elsewhere, external controls have been variously applied to pathologists and through them to the laboratory services they influence. These external controls were effected directly by generic managers, mediated through competition for state funding, or mediated through other medical professionals.

The pathologist-dominated, but balanced, Laboratory Services Advisory Committee (LSAC) became defunct with the establishment of the Regional Health Authorities in 1993, after almost twenty years during which it had been consulted less and less frequently.

The introduction of the purchaser /provider split into New Zealand's public health system, in 1993, offered an opportunity to impose powerful external controls on all health professionals who were state funded or state subsidised (i.e. most) by way of the contract-for-services process. The most notable impacts on pathologist status arose from the commercial take-over of so many formerly pathologist-owned laboratories, and the pressure to limit pathologists' contribution to advisory bodies, owing to a perceived 'conflict of interest'.

New Zealand witnessed, in mid-2000, an Inquiry into misreporting by a Gisborne pathologist through the 1990s to 1996 (Ministerial Inquiry into Under-reporting of Cervical Smear Abnormalities in the Gisborne Region, 2000). Accused of some measure of culpability for the errors,

the RCPA, through a representative, pointed to its badly eroded relations with the HFA. Inquiry transcripts make it clear that Midland RHA through the mid-90s relied entirely on the contracting process to ensure external quality control, having no pathology expertise within the organisation. Contract monitoring was minimal (Mules, 2000).

Some of the managerial changes were positive in their effects. One pathologist gave the shift in emphasis to a more commercial approach, guarded approval:

“On balance it has probably helped morale in most areas, and provided the stimulus for a number of staff and structural changes.... The lab is now working closer to its full capacity” (Senior hospital-based pathologist, 1999).

The same pathologist qualified this comment, admitting that at least some of these service changes would have occurred in any case ‘because of changes in the way in which modern medical services are now delivered’.

Others, like the laboratory professionals associated with the Aoraki Corporation and its ill-fated Cardinal Community Laboratories discussed above, saw opportunities for corporate investment and private gain. Most private sector pathologists, however, noted with disquiet a ‘lack of concern’ for quality issues on the part of the health funding authorities (Beer, 2000, p.8).

It is generally accepted that most problems in laboratory testing arise from the pre- and post-analytical portions of the testing cycle, i.e. to test choice and uses made of test data. Translating the implications of laboratory test results for use in decision-making by clinicians, patients, family members, and policy-makers, should be a part of any clinical laboratory service of good quality. Expert input from pathology professionals, however, was effectively suppressed over the 1990s, and the brief for laboratory professionals became limited to the strictly technical. Hospital pathology postgraduate-level scientist positions were either disestablished in 1993 or lost by attrition throughout the 1990s. In 2001, the newly constructed Auckland Hospitals’ ‘A Plus’ laboratory failed to attain IANZ accreditation: compulsory for all laboratories only since 2000. A report commissioned by the Auckland District Health Board on the troubled newly combined laboratory,

pointed to the reduced support for scientific research and development for at least five years, as a major concern of staff (Johnston, 2001).

The impact of pro-market emphases on continuing education was also a concern for pathologists interviewed for this project. In an article on the Otago Medical School, Hunter (1998) regretted that previous regulatory legislation committing hospital boards to undergraduate medical teaching was omitted from the Health Reforms Act of 1993. Medical teaching and research were no longer to be regarded as core services of the 'teaching' hospitals.

4. How did features of the total environment influence outcomes?

Of the targeting schemes, only the Free Child Health Care Scheme introduced by the New Zealand First-National coalition government elected in 1996 appears to have achieved its access goal. There is no evidence from the study reported here that targeting the GMS subsidy improved access for the needy. The cost containment initiatives examined also failed to achieve their objectives. This section of the monograph examines some factors not addressed by the 1990s reforms, but crucial to their failures.

State expenditure and access: Evidence presented in the previous section supports the proposition that cost became a major barrier to primary care utilisation through the 1990s. Results of the GP encounter rate analyses suggest that the practices monitored saw reduced utilisation by unsubsidised patients, rather than the improved access for lower income patients intended, when targeting of the GMS subsidy was introduced in 1991. The increase in qualifying-income for the CSC, implemented in mid-1996, was apparently inadequate to compensate for continuing financial stress, particularly in the non-CSC-holding population. Further evidence of a cost-barrier effect comes from the data reported on GMS group A (adults-of-working-age) who would have paid more for their consultations whether CSC card holders or not (as their state GMS subsidy is lower than that for other groups). Because laboratory testing is universally subsidised, it might be seen by doctors as a means of adding value to a consultation without incurring extra charge to patients perceived as already under financial stress. This would explain the disproportionately high and increasing rates of laboratory testing for the group.

Data reported in this monograph on avoidable hospitalisations suggest that threats to health service uptake might lie in placing too heavy a reliance on primary care, whether privately or publicly controlled, as a first-line defence against ill health. Pool (1999) has drawn attention to the dangers inherent in basing comprehensive health care programmes on current service users as the basic unit, rather than on defined populations. Policy changes during the last two decades of the

twentieth century were not confined to the health sector. Changes in housing, welfare and employment policy from 1984 onwards might well have impacted on population health (Brown, 1999, National Health Committee, 1998). Results on infant avoidable hospitalisations suggest that even after removal of the fee barrier to primary care access, further barriers to the attainment of better health status might remain, particularly for Maori.

State expenditure and demand control: Increasing expenditure on laboratory diagnoses was predominantly volume driven, and demand control measures proved ineffective in the long term. There are suggestions in the data gathered for this project that underlying service design features added to trends already listed in this monograph, to drive test volume growth.

- The absence of a part-charge might prompt high and increasing use of laboratory testing as discussed above for GMS group A. This feature could be interpreted as in-built 'compensation' in the present income-related, part-charging regime. While all patients must pay some contribution towards both GP visits and prescribed pharmaceuticals, laboratory tests are fully reimbursed by the state and, therefore, seen as 'free' by both patients and GPs. A fully subsidised primary service, which is a goal of the present government, would remove the anomaly.
- The practice of fee-for-test reimbursement independent of volume might encourage both hospital-based and community laboratories to market their services more aggressively among GPs, thus driving test volumes up, as discussed below.

State expenditure and public/private laboratory competition: Also endemic to the service design is the dual nature of the service provision. Since New Zealand clinical laboratory services are state funded, whether provided publicly or privately, the question as to which sector (or, combination of public/private) provides the most cost-efficient service is pertinent. It is, however, not easily answered. In the hospital environment, research and training costs are difficult to separate out and quantify. Overheads are high, and their allocation to services highly complex, as the considerable costs of patient 'hotel' accommodation and HHS administration must be shared over all 'treatment' departments. Private-company owned laboratories must

return a profit to shareholders. As the decade progressed, these shareholders became more and more likely to be located offshore.

Reasons for a relatively high expenditure on testing in New Zealand would include distance from diagnostics suppliers, sliding currency exchange values, and dispersed population (which has led, historically, to the sub-optimal service-provider size). However, another major influence on laboratory economics is the dual system of remuneration, which hinges on where the tests originate. Fee-for-test remuneration for tests originating in the primary- or private- sector provides a strong incentive for all laboratories to market their services aggressively in that sector. With modern automated equipment, higher test volumes should lead to efficiencies of scale. However, the fee-for-test remuneration system precludes the transfer of such economies to the state, whether the tests are performed in the public or the private sector.

Currently, neither the public nor the privately owned laboratories quote prices for primary sector-sourced tests that are based on a standardised costing process. A mean *price*-per-test of just under \$10 was paid for primary-referred schedule tests in 1999/2000. At the same time Waikato Hospital laboratory estimated its mean *cost*-per-test for the same year at \$1.93, excluding some hospital and corporate overheads. Although an Australian group under the Royal College of Pathologists of Australasia has developed a standardised laboratory benchmarking system (Gordon, Holmes, McGrath and Neil 1999), no attempt at standardising methods for calculating overheads in New Zealand hospital laboratories has yet been made. Nevertheless, the five-fold discrepancy between costs and prices cited here, suggests a need for a closer look at test reimbursement formulae.

A system that rewards laboratories in direct proportion to the number of tests reported, gives all laboratories strong incentives to retain historical, pre-automation test prices, inflate special test prices, and maximise non-hospital specimen volumes. Without intervention, perverse incentives built into the funding and remuneration systems of both sectors will continue to frustrate the achievement of a cost-effective clinical laboratory service in New Zealand. Furthermore, our uncapped and highly volume-dependent remuneration for primary sector-sourced tests makes the country a lucrative target for Australian-based investors, and for Australian-based laboratories, now that technological and transport advances have made a common

laboratory market possible (France, Francis and Lawrence, 2003, in press). The net effect, could be losses of skilled jobs and training capacity in New Zealand unaccompanied by economies to the public purse

Collusion to maintain high prices can develop wherever health service providers compete primarily on price. Two preconditions would seem to favour such collusion: poorly constrained demand for services paid for by a third party; and funding levels for services to the public and private sectors that are widely discrepant. Such funding discrepancies arise when at least one funding formula fails to reflect accurately the costs of providing an efficient service.

In summary, the cost containment initiatives of the 1990s reforms appear to have been overwhelmed by a range of factors, some of which were systemic from the very beginnings of the state's involvement in comprehensive health care in New Zealand.

5. *How can the service be improved?*

In discussing the essence of good design, Warner (1997) emphasised the value of an evidence-based approach. Re-organisation, or re-structure, can be experimental, and instituted without rigorous justification. The re-design of a service, however, should build continuously on available evidence as it comes to hand. The following laboratory service redesign recommendations, along with their rationales, arose from research findings summarised in this monograph.

The change towards market controls not only destroyed assets of the existing centrally controlled laboratory system (co-operative arrangements between centres and sectors, attractive career structures, a research and development-oriented culture), but greatly increased expenditure on laboratory testing 'with no clearly demonstrable evidence of health gain' (HFA, 1999, p. 10). Additional costs, the transaction costs of contracting, have added to the price-per-test borne by the taxpayer but, sadly, it would seem, to no advantageous end.

- **Competitive contracting as a means of price control for diagnostic laboratory services should be abandoned.**

One approach to cost-efficiency (HFA, 1999) would require providers to tender separately for components of a laboratory service. Although it would increase transaction costs, separate tendering has the merit of encouraging individual laboratories to specialise, or concentrate effort in fewer areas, e.g. in cytology/histology, automation, molecular diagnostics, or in the provision of a regional specimen collection and distribution network. Such specialisation could result in improved cost-efficiency. Material gathered for this project, however, suggests that segmented tendering would be no more likely to reveal 'correct' prices (HFA, 2000) than the present across-the-board service tendering. This is because the participation of hospital laboratories is essential to

maintaining market conditions in most parts of New Zealand and, while they remain under-funded for their inpatient workload, hospital managers have every incentive to bid at well above cost for any service provided to non-inpatients.

- **All laboratory remuneration should be cost-based and not dependent on specimen origin.**

Ministry officials have suggested using a formula for reimbursing 'primary-schedule' tests, that more closely reflects their most efficient cost, by dividing 'schedule' test reimbursement fees into agreed fixed and variable (volume dependent) components (HFA, 1999). This process would reduce incentives for laboratories to lift volumes to high levels through intensive marketing. Reaching agreement on a remuneration formula, however, given current costing information deficiencies, would be a predictable stumbling block to this approach. Without valid measures of relative financial performance for laboratories, it is impossible to make inter-laboratory, inter-sectoral or international cost-efficiency comparisons for use as target benchmarks in a post-contestable-market environment.

- **Costing methodology already developed and tested in Australia should be introduced here in order to define remuneration formulae, and guide more rational approaches to clinical laboratory expenditure.**

One side effect of provider competition was to exclude pathologists from advisory and decision-making roles. A loss of service cohesiveness resulted and, in the case of several patients whose inaccurate laboratory reports went unmonitored, tragedy occurred (Duffy, Barratt and Duggan, 2001). Laboratory markers, technology, information systems, and modes of service delivery are all changing rapidly. A government unable to accept expert advice for fear of 'conflict of interest' will not be well placed to make innovative policy for the efficient delivery of laboratory services.

- **A Laboratory Services Advisory Committee, representative of clinical laboratories in both sectors, should provide advice to the Ministry of Health on national service delivery, clinical guidelines, and IT/education/research needs.**

To achieve more cost-efficient service delivery, British National Health Service advisors have suggested the consolidation of laboratory service-providers into a core laboratory servicing a population of one million, with local satellite facilities covering more acute needs: the whole forming a co-operative consortium (Price and Barnes, 1999). New Zealand circumstances might dictate modifications to this format, but increased co-operation over limited state-funded diagnostic resources will inevitably be required if waste is to be avoided.

- **Regional laboratory committees should be set up to plan and co-ordinate the ongoing rationalisation of services throughout their regions, in the interests of cost-efficiency.**

An unfortunate side effect of the emphasis on 'customer focus' was burgeoning test volumes: an outcome reinforced by the imbalance between those components of the system, like laboratory testing, that were free to patients, and those requiring co-payment. Additional revenue brought to the hospital from over-priced tests allows departmental budgeting systems, designed to encourage discrimination in clinicians' use of diagnostic resources, to be undermined. Furthermore, in the primary sector, most IPAs opted to forgo some budget-holding benefits in return for the right to additional funding when needed. In short, inadequate incentives and penalties built into the demand control systems of both sectors meant that controls on test volumes were largely ineffective.

Electronic decision support or expert systems, designed to guide doctors through test ordering and differential diagnosis, have the potential to reduce unnecessary testing and improve the quality of clinical laboratory utilisation. Expert systems have been shown to save

on testing costs, and to shorten the time required to reach a diagnosis (Smith and McNeely, 1999).

- **The development and trial of expert systems particularly in large hospital settings where the less common tests are performed, holds promise as a constructive route towards achieving a solution to clinical laboratory misuse in both sectors.**

The redesign of the New Zealand laboratory system suggested here will yield savings largely at the expense of medical laboratory technologist positions. This projected loss, however, coincides with much publicised workforce shortfalls in other areas of medical technology (e.g. radiography, radiation and cardiac technology). The British NHS executive reviewed future NHS staffing requirements in 1999. A suggestion arising out of the NHS review, and one that must surely resonate in this country was that there were too many scientific and technical professions in the medical workforce. The executive envisaged, long-term, 'a generic workforce with a core of transferable skills which can be moved to meet changing demands as well as enabling more opportunities for career development' (Price and Barnes, 1999, p. 33).

- **Technology retraining programmes aimed at achieving suitable medical laboratory technologist redeployment within the health system should be instated in main centres in the short-term. Meanwhile, providers of workforce training should aim at developing greater flexibility in the health technology workforce.**

Bibliography

- Bedford, R, Goodwin J (1997) *Migration and Urban Population Change: A Preliminary Analysis of the 1996 Census Data*. Population Studies Centre, University of Waikato, NZ.
- Beer, ID (2000) *Brief of Evidence: Ministerial Inquiry into Under-reporting of Cervical Smear Abnormalities in the Gisborne Region*. <http://www.csi.org.nz> Accessed November 2000.
- Brown, MC (1999) Policy-induced changes in Maori mortality patterns in the New Zealand economic reform period. *Health Economics* 8: 27-36.
- Brown, RA, Swanson Beck, J (1994) *Medical Statistics on Personal Computers*. BMJ Publishing, UK.
- Burtis, CA (1996) Converging technologies and their impact on the clinical laboratory. *Clin Chem* 42: 1735-49.
- Conn, RB, Snyder, JW (1997) Changes in the American health care system: crisis in the clinical laboratory. *Clin Chim Acta* 267: 33-49.
- Davis, P, Gribben, B, Lay Yee, R, McAvoy, B (1994) The impact of the new subsidy regime in general practice in New Zealand. *Health Policy* 29:113-125.
- Duffy, AP, Barratt, DK, Duggan, MA (2001) *Report of the Ministerial Inquiry into the Under-reporting of Cervical Smear Abnormalities in the Gisborne Region*. <http://www.csi.org.nz/> Accessed September 2001.
- Forsman, RW (1996) Why is the laboratory an afterthought for managed care organisations? *Clin Chem* 42: 813-6.

- France NC (2000) Market testing the testers: lessons from recent New Zealand clinical laboratory management strategy. *NZ Med J* 113: 338-40.
- France NC (2001) *Testing times: New Zealand's clinical laboratories under the 1990s health sector reforms*. Unpublished thesis, University of Waikato, New Zealand.
- France, N, Francis, G, Lawrence, S, Sacks, S. (2001) Measuring performance improvement in a pathology laboratory: a case study. *AAANZ Conference, July, 2001: Proceedings*.
- France, N, Lawrence, S, Smith, J F. (2001) New Zealand pathologists: a case study in occupational control. *J Management in Medicine* 15: 28-43.
- France, N, Smith, J F, Lawrence, S. (2002) Pathology services as a pilot for the market-led control of health services in New Zealand. *Public Management Review* 4: 1-22.
- France, NC, Francis, GAJ, Lawrence, SR, Sacks, S. (2002) Costing counting and comparability: aspects of performance measurement in a pathology laboratory. (*Pacific Accounting Review*, in press.)
- France, NC, Francis, GAJ, Lawrence, SR. (2003) The costs of New Zealand pathology. (*Health Policy*, in press).
- Guba, ES, Lincoln, YS. (1989) *Fourth generation evaluation*. Sage: Newberry Park, California, USA.
- Gordon, M, Holmes, S, McGrath, K, Neil, A. (1999) Benchmarking pathology services: implementing a longitudinal study. *Pathology* 31: 133-41.
- Health Funding Authority (HFA) (1999) *Laboratory Services Strategy and Consultation on Strategy for Prices and Providers and Management Proposals for Primary Referred Laboratory Services*. (13 July, 1999). <http://www.hfa.govt.nz/DisplayList.cfm?PubTypeID=PrPub> Accessed August, 1999.

- Health Funding Authority (HFA) (1999). *Request for Proposals for Best Practice Education* Ministry of Health, Wellington, NZ.
- Health Funding Authority (HFA) (3 May 2000) *Improving our health: Personal Health report. Laboratory contracts: poised to move forward.* <http://www.hfa.govt.nz/data> Accessed October, 2000.
- Hunter, JD (1998). The Otago Medical School revisited. *NZ Med J* 111: 272-3.
- Johnston, M (2001) Medical staff slam lab management. *Weekend Herald* July 21-22, Sect A18.
- Kennedy, RT (1978) The rising laboratory workload: a critical appraisal of cause and effect. *Department of Health Occasional Papers*. Wellington, NZ.
- Laughlin, R, Broadbent, J (1996) Redesigning fourth generation evaluation: an evaluation model for the public sector reforms in the UK? *Evaluation* 2: 431-51.
- Malcolm, L (1993) Trends in primary medical care related services and expenditure in New Zealand 1983-93. *NZ Med J* 106: 470-4.
- Malcolm, L, Wright, L, Barnett, P (1999) *The Development of Primary Care Organisations in New Zealand*. Ministry of Health Publications, Wellington, Ministry of Health, NZ.
- Malcolm, L, Wright, L, Seers, M, Davies, L, Guthrie, J (2000). Laboratory expenditure in Pegasus Medical Group: a comparison of high and low users of laboratory tests with academics. *NZ Med J* 113: 79-81.
- Ministerial Inquiry into Under-reporting of Cervical Smear Abnormalities in the Gisborne Region*. Transcripts of proceedings. <http://www.csi.org.nz> Accessed November, 2000. Ministry of Health (2000)

- Ministry of Health Performance monitoring and review unit (1996, 1997, and 1998) *Purchasing for Your Health: 1994/95, 1995/96, and 1996/97*. Ministry of Health, Wellington, NZ.
- Ministry of Health (2000) *Health Expenditure Trends in New Zealand*. Ministry of Health Publications. Wellington, NZ. <http://www.moh.govt.nz> Accessed July 2001.
- Mules, CP (2000) *Transcript of Proceedings of the Ministerial Inquiry into Under-reporting of Cervical Smear Abnormalities in the Gisborne Region*. p. 1240, 10th May. <http://www.csi.org.nz> Accessed August 2000.
- National Advisory Committee on Health and Disability (1998) *The Social, Cultural and Economic Determinants of Health: Action to improve Health*. Box 5013, Wellington, NZ.
- New Zealand Board of Health (1974). *Report of the Committee of Inquiry into Clinical and Public Health Laboratory Services*. NZ Board of Health Report Series No. 22. Wellington, NZ.
- New Zealand Health Information Service (NZHIS) (2001) *Health Statistics: New Zealand Workforce Statistics 2000*. <http://www.nzhis.govt.nz/stats/genpracstats-p.html> Accessed July 2001.
- Pappas, G, Hadden, WC, Kozak, LJ, Fisher, GF (1997) Potentially avoidable hospitalisations: inequalities in rates between US socio-economic groups. *Am J Public Health* 87: 811-6.
- Pool, I (1999) People (= population) and public policy in New Zealand. *New Zealand Population Review* 25: 57-79.
- Pratt, R (1996) In: Managed care: practical lessons and current issues for New Zealand. *Healthcare Review - OnlineTM*. 1(1); April 1996. p. 14. http://www.enigma.co.nz/hcro_articles/9604/vol1no1_001.htm

Price, CP, Barnes, IC (1999) Laboratory medicine in the United Kingdom: 1948-1998 and beyond. *Clin Chim Acta* 290: 5-36.

Salmond, C, Crampton, P (2000). Deprivation and health. In: Tobias M, Howden-Chapman P eds. (2000) *Social Inequalities in Health: New Zealand-1999*. Ministry of Health, Wellington, NZ.
http://www.moh.govt.nz/moh.nsf/wpg_Index/Publications-Index
Accessed, June 2001.

Sinclair, R (1998). Abnormal diagnoses drop as lab tests fall. *NZ Doctor*, 1 April, 1998.

Smith BJ, McNeely, MDD (1999) The influence of an expert system for test ordering and interpretation on laboratory investigations. *Clin Chem* 45: 1168-75.

Stewart, DT (1997) Private laboratories; Society and college. In *A History of Pathology in New Zealand*. RCPA(NZ) and NZ Society of Pathologists.

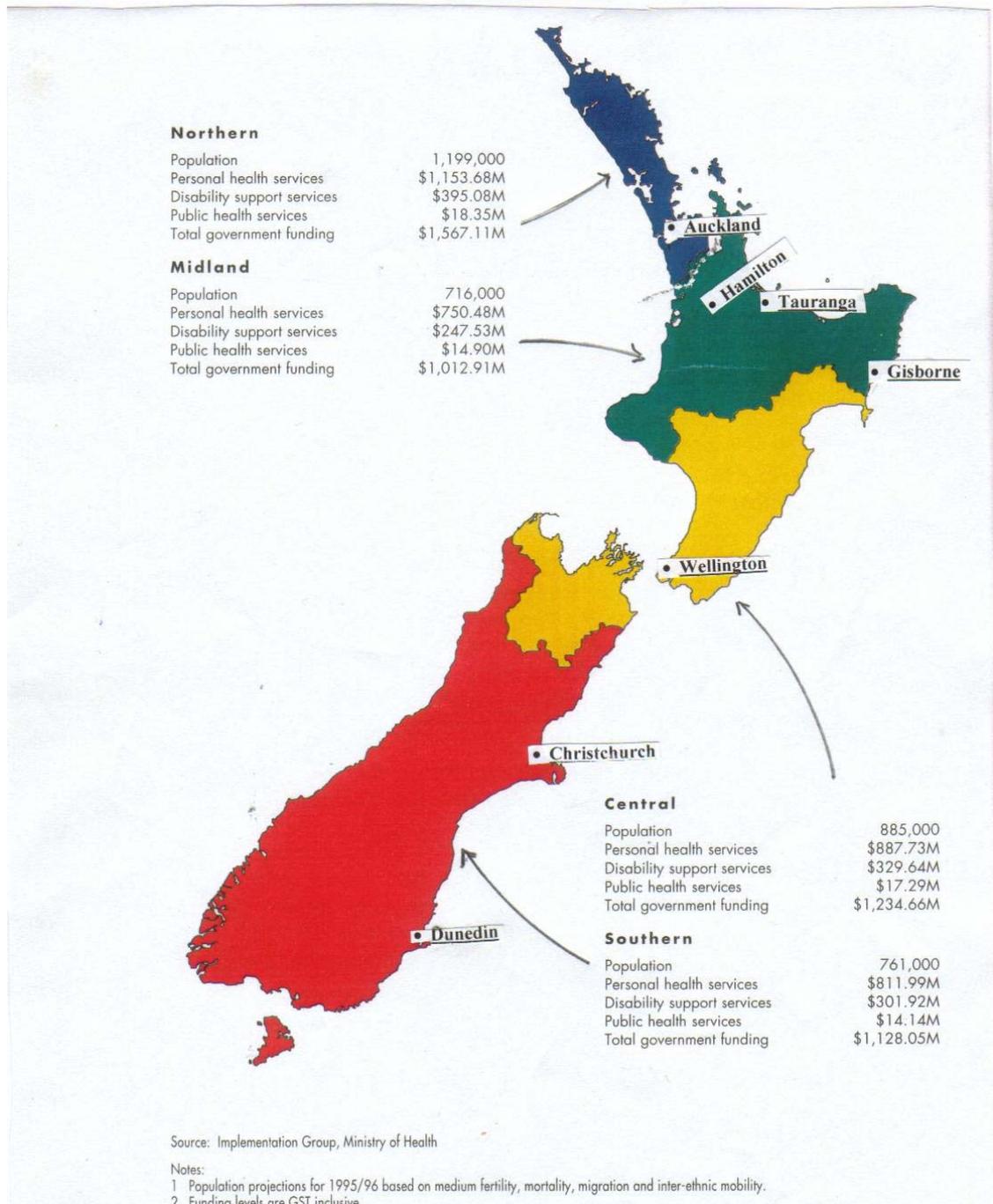
Upton, S (1991) *Your Health & the Public Health. A statement of government health policy*. Ministry of Health, Wellington, NZ.

Warner, M (1997) *Redesigning Health Services: Reducing the Zone of Delusion*. Nuffield Series No. 1. Nuffield Trust, London, UK.

Weissman, JS, Gatsonis, C, Epstein, AM (1992) Rates of avoidable hospitalisation by insurance status in Massachusetts and Maryland. *JAMA* 268: 2388-94.

Appendix: New Zealand Health Authority Regions

1993 to 1998



OTHER PAPERS IN THIS SERIES

1. Lawrence, S.L. Rational and social aspects of management accounting practice: report of a field study, June 1990.
2. Northcott, D.N. Capital budgeting in practice: past research and future directions, August 1990.
3. Cheung, J., Vos., E. and Low, C.K. IPO underpricing in New Zealand, September 1990.
4. Van Peurse, K.A. Extant research in public sector accountability, March 1991.
5. Van Peurse, K.A. New Zealand auditor perceptions: difficult and critical audit procedures, July 1991.
6. Alam, M. The budgetary process from information processing perspectives, September 1991.
7. McCracken, T. & Hooper, K. The New Zealand goods and services tax (GST): identifying the problem areas, September 1991.
8. Lowe, A. Strategic management accounting, September 1991.
9. McCracken, T. Pricing: a review of contemporary approaches, February 1992.
10. Cheung, J. Estimating costs of capital for small ventures, March 1992.
11. Cheung, J., Vos, E., & Bishop, D. Pre-holiday returns in the New Zealand share market, May 1992.
12. Van Peurse, K.A. Accountability for social policy: a moral framework, June 1992.
13. Alam, M. & Poulin, B.J. Budget as a discipline: lessons from a turnaround enterprise, December 1992.
14. Raj, M. Pricing options on short and long-term yields using stochastic arbitrage based models, May 1993.
15. Godfrey, A. & Hooper, K. Domesday Book: its significance as an accounting document, June 1993.
16. Van Peurse, K.A., Lawrence, S.R. & Pratt, M.J. Health management performance: a classification and review of measures and indicators, July 1993.
17. Coy, D. & Goh, G.H. Overhead cost allocations by tertiary education institutions 1989-91, September 1993.
18. Coy, D., Dixon, K. & Tower, G. The 1992 annual reports of tertiary education institutions: quality, timeliness and distribution, November 1993.
19. Van Peurse, K.A. & Tuson, C. Financial reporting in Area Health Boards 1987-1992, January 1994.
20. Vos, E. & Davey, H. Time consistent accounting standards as a necessary condition for relating "point in time" accounting information to market returns, April 1994.

21. Coy, D., Buchanan, J. & Dixon, K. The users of New Zealand tertiary education institutions' annual reports: who are they and what information do they seek? December 1994.
22. Coombes, R. & Davey, H. The New Zealand accountant's role in environmental accountability, December 1994.
23. Wells, P.K. Marketing regulation and compliance programmes, November 1995.
24. Haslam, J. Analysis of accounting as at the end of the Napoleonic war: towards a critical theoretical history of the prescribing of accounting by the British State, November 1995.
25. Haslam, J. The British state and the prescribing of accounting, 1815-1830: a focus upon the regulating of friendly societies and savings banks in the post-Napoleonic war context, November 1995.
26. Haslam, J. Accounting publicity and the revolution in government, November 1995.
27. Haslam, J. Accounting history as critique of the present: a critical theorising of interfaces between accounting and the British state of the early 1840s, November 1995.
28. Dosa, L., Gallhofer, S. & Haslam, J. Accounting's location in a transition process: a focus upon Hungary, November 1995.
29. Gallhofer, S. & Haslam, J. Accounting on the road: turnpike administration in early nineteenth century Britain, November 1995.
30. Ciancanelli, P., Gallhofer, S., Haslam, J. & Watson, R. Pay systems and social ideology: the case of profit related pay, November 1995.
31. Jenkin, Erica and Van Peurse, Karen A. Expert systems in auditing: New Zealand auditor perspectives, November 1995.
32. Wells, P.K. Marketing regulation and compliance programmes: attitudes and reactions of New Zealand marketing managers in 1988, November 1995.
33. Davey, H.B., Bowker, T. & Porter, B. New Zealand's controlled foreign company regime, November 1995.
34. Davey, H.B., Barnes, H. and Porter, B. External environmental reporting: the need for a New Zealand standard, November 1995.
35. Lawrence, Stewart, Rethinking professional ethics: a religious metaphor for accountants, November 1995.
36. Ciancanelli, P., Watson, R., Gallhofer, S. & Haslam, J. Alternative perspectives on finance: a critical analysis, November 1995.
37. Gallhofer, Sonja & Haslam, J., Beyond accounting: the possibilities of accounting and "critical" accounting research, November 1995.
38. Gallhofer, Sonja, "It really challenged everybody": accounting and critical and feminist pedagogy, January 1996.
39. Gallhofer, Sonja, and Haslam, Jim, The direction of green accounting policy: critical reflections, January 1996.

40. Wells, P.K., Marketing regulation and compliance programmes: attitudes and reactions of New Zealand marketing managers in 1995, February 1996.
41. Pratt, Michael and Coy, David, Managing teaching allocations in a university department: the TAMM model, June 1996.
42. Coy, David and Pratt, Michael, The spider's web: politics and accountability in universities, June 1996.
43. Doolin, Bill, Organisational roles of decision support systems, June 1996.
44. Beale, Bob and Davey, Howard, The nature and origins of comprehensive income, August 1996.
45. Davey, Howard, and Holden, Mark, Emerging directions in the evaluation of foreign subsidiary performance, September 1996.
46. Kelly, Martin, A personal perspective on action-research, October 1996.
47. Doolin, Bill, Defining decision support systems, November 1996.
48. Gallhofer, Sonja, Haslam, Jim and Pratt, Mike, Developing environmental accounting: insights from indigenous cultures, November 1996.
49. Ciancanelli, Penny, Gallhofer, Sonja, Haslam, Jim and Watson, Robert, In the name of an enabling accounting: critical reflections developed and enhanced through an analysis of accounting and profit-related pay, November 1996.
50. Lowe, Alan, The role of accounting in the processes of health reform: providing a "black box" in the cost of blood products, November 1996.
51. Coy, David and Buchanan, John, Information technology diffusion among business professionals: Preliminary findings of a longitudinal study of spreadsheet use by accountants 1986-96, February 1997.
52. Beale, Bob and Davey, Howard, Total recognised revenues and expenses: an empirical study in New Zealand, March 1997.
53. Coy, David, Nelson, Mort, Buchanan, John and Jim Fisher, Spreadsheet use by accountants in Australia, Canada and New Zealand: preliminary findings, March 1998.
54. Wells, P.K., Manapouri: catalyst or consequence? October 1998.
55. Lowe, Alan, Tracing networks through case studies, October 1998.
56. Kim, S.N. and Mfodwo, K., Prospects for the establishment of Islamic banking in New Zealand: a contextual analysis, November 1998.
57. Van Peurse, K.A., Method for a methodology: a new approach for the middle range, November 1998.
58. Locke, Joanne and Perera, Hector, An analysis of international accounting as a catalyst for the re-integration of accounting research, August 1999.

59. Julian, Aileen and Van Peurseem, Karen, Ethics education and the accounting curriculum: can ethics be taught?, August 1999.
60. Van Peurseem, K.A., Wells, P.K. and L'Huillier, B. Contracting services in SMEs: A New Zealand professional accounting firm case study, September 1999.
61. Lowe, Alan, Accounting in health care: providing evidence of a real impact, September 1999.
62. Alam, Manzurul and Wells, Philippa, Control systems of government-owned business enterprises: a critical analysis of the New Zealand model, November 1999.
63. Kelly, Martin, In Praise of Holistic Education in Accounting, December 1999.
64. Smith, Susan Ann and Coy, David, The quality of city council annual reports, 1996-97 and 1997-98: Preliminary findings, March 2000.
65. Hooper, Keith and Low, Mary, Representations in accounting: the metaphor effect, June 2000.
66. Dixon, Keith, The impact of management control across a hospital system, August 2000.
67. Lowe, Alan, Accounting information systems as knowledge-objects: some effects of objectualization, August 2000.
68. Locke, Joanne and Lowe, Alan, A market test of the ranking of accounting journals: an Australasian perspective, October 2000.
69. Francis, Graham, Humphreys, Ian and Jackie Fry, Lessons for other counties from the privatisation, commercialisation and regulation of UK municipal airports, December 2000.
70. Hooks, Jill, Coy, David and Howard Davey, Information disclosure in the annual reports of New Zealand electricity retail and distribution companies: preliminary findings, January 2001.
71. Lowe, Alan, Methodology, Method and Meaning in Field Research: Intensive Versus Extensive Research Styles in Management Accounting, March 2001
72. Van Peurseem, Karen, Locke, Joanne and Harnisch, Neil, Audit Standard Analysis: An Illocutionary Perspective on the New Zealand Going Concern Standard April 2001
73. France, Necia, Francis, Graham, Lawrence, Stewart and Sacks, Sydney, Measuring Performance Improvement in a Pathology Laboratory: A Case Study, April 2001
74. Hooper, Keith and Davey, Howard, Preferences on Learning Options in Accounting Education: A New Zealand/Asian Perspective, May 2002
75. Lowe, Alan and Locke, Joanne, A Paradigm Sensitive Perspective on the Ranking of Accounting Journals: A Web-based survey Approach, May 2002