

‘The Celluloid Strip’ — Mass Screening for Tuberculosis in New South Wales, 1950–1975

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Abstract: Tuberculosis was a significant cause of mortality at the beginning of the Second World War when the technique of taking miniature X-ray photographs on movie film was introduced to Australia as part of the medical examination of men enlisting in the armed forces. Immediately after the war, the Anti-Tuberculosis Association of NSW expanded its existing diagnostic clinic in Sydney to provide a mobile X-ray service to country areas and industry. That experience provided a model for the subsequent national campaign which the Commonwealth Government funded to detect and treat the disease.

Coincidentally, at the same time as the compulsory national screening program commenced, the first effective therapy for the disease became available. Antibiotic drugs soon achieved results that long periods of rest in a sanatorium had never accomplished. Government funding was withdrawn after the incidence of tuberculosis diminished, so that by 1975 the ubiquitous X-ray caravans began to disappear from street corners around Australia. This paper describes the logistics of the mass screening campaign during the third quarter of the twentieth century, and the technological developments that made it possible.

Keywords: tuberculosis, camera, radiography, screening, X-ray, Anti-Tuberculosis Association

The White Death, consumption, phthisis, TB – by whatever euphemism it was known, tuberculosis was one of the most feared human diseases for at least three millennia. Despite the romantic deaths of operatic heroines like Mimi and Violetta, the reality for most people was more stark. Lassitude and nighttime sweating were early symptoms of pulmonary tuberculosis, followed by a chronic cough, loss of weight and a pallid complexion as the disease progressed, until the terminal stage when the victim was spitting blood. If the patient was the male breadwinner, most families then faced destitution.

When the German bacteriologist Robert Koch devised a technique to visualise

the *Mycobacterium tuberculosis* bacillus in 1882, medical practitioners realised that the disease had a microbiological origin, and was not a hereditary affliction or punishment for a dissolute lifestyle as previously believed. Understanding the aetiology was one thing; developing effective therapy that could overcome these germs was another matter.

In the late nineteenth century, the favoured treatment was bed rest, fresh air and a diet rich in saturated fats, preferably taken at a sanatorium in a fashionable resort on a ‘Magic Mountain’ in the Swiss Alps. For most people this was out of the question. In Australia, from the 1870s there were small private or charitable sanatoria

that catered for a handful of patients, but most sufferers stayed at home infecting the other family members who shared their bed or eating utensils. If a patient was too ill to be cared for at home, or had no family, he or she went to one of the State Asylums to die, surrounded by the demented and insane.

It was 1911 before the NSW Government opened the large Waterfall Sanatorium for Consumptives, and by this time there were smaller establishments run by the Red Cross Society and the Queen Victoria Homes on the Blue Mountains and in the Picton area. Sanatoria were some help in preventing the spread of infection, but few of the patients recovered their health.

Various other treatments were tried. Koch himself developed *Tuberculin*, which was popular for a period, and seemed to improve the condition of certain patients. Less reputable practitioners advocated their own miracle cures, such as Spahlinger’s Serum and the expensive, but ineffective gold extract *Sanocrysin*. ‘Artificial sunlight’ enjoyed a vogue in the United Kingdom, but Australia seemed to have enough of the natural variety. Throughout this period, the incidence of tuberculosis in the community was actually declining, which gave physicians an unwarranted sense of optimism about the treatments they were advocating. Nevertheless, in 1910 tuberculosis remained, after heart disease, the most common cause of death in New South Wales.

In 1895, Wilhelm Röntgen discovered the remarkable powers of certain electromagnetic emissions to penetrate the human body, and to visualise the internal organs on a fluorescent screen. By the end of the first decade in the twentieth, primitive X-ray machines were installed in the main Sydney teaching hospitals for orthopaedic

procedures such as reducing dislocations or fractured bones. Some physicians also recognised the potential of the technique for revealing abnormal pathology in the lungs, particularly tuberculosis, but their more conservative colleagues were sceptical, claiming that their own experience enabled them to identify tuberculosis sufferers by physical examination and auscultation of the chest through a stethoscope. Pathology tests did become routine, however, with sputum specimens subjected to microscopic examination to determine whether the tuberculosis bacillus was present.

In New South Wales, the first X-ray equipment dedicated to the diagnosis and assessment of tuberculosis was installed at Waterfall Sanatorium in 1929, to be followed shortly afterwards in 1930 by the Anti-Tuberculosis Association of NSW at its chest clinic at Albion Street in Surry Hills. Their Kelly-Koet apparatus was a Heath Robinson contraption by modern standards, and of relatively low efficiency, although at the time it was described as ‘one of the most delicate instruments of its kind in existence’. The radiologist could examine the patient directly through a fluorescent screen placed in front of the chest, or a large piece of specially-coated photographic film would be exposed in a light-tight magazine, to give a life-size image that could be processed and examined later.

The Anti-Tuberculosis Association of New South Wales, later known as Community Health and Tuberculosis Australia, had been founded by a group of influential concerned citizens in 1911 to grapple with the misery caused by tuberculosis amongst the impoverished residents of Sydney who could not afford private treatment. Many of the Association’s practices became a model for

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other voluntary organisations and government agencies throughout Australia. This paper refers mainly to the New South Wales experience because that can be regarded as a microcosm of the later national campaign.

Early X-rays were a great help in confirming a diagnosis of tuberculosis, but it was a slow, inflexible and relatively expensive procedure. With only a handful of machines available, the technique could be used only with high-risk groups. To illustrate this point, the Anti-Tuberculosis Association recorded only 351 X-rays in its first year of providing this service in one of the poorest parts of Sydney, where there was a high incidence of tuberculosis. It was 1937 before more than one thousand X-rays were taken in a single year. By 1941 this had risen to almost three and a half thousand, with 172 confirmed cases of tuberculosis detected, a rate of one in twenty, which was a rather disturbing result that was never equalled in the later mass surveys.

The obvious limitations of the early technique stimulated researchers to look for a simpler, cheaper solution. In 1936, Dr Manuel de Abreu in Rio de Janeiro began the first mass survey experiments with a camera using 35 mm cinema film. He mounted the camera in an enclosure behind the fluorescent screen so that he could photograph the image, using a wide-angle lens and the faster film emulsions that were becoming available. After reading about these experiments, Dr Harry Wunderly improvised some equipment along the same lines in his Adelaide consulting rooms in 1939. A standard Leica camera was fixed to a cardboard tunnel with adhesive tape. Because the level of this home-made device could not be adjusted, it is said that

Wunderly kept a pile of old medical books nearby so patients of different sizes could stand at the correct height for the screen. Some practitioners were sceptical that such a small image (36 mm x 24 mm) would be useful, compared with the image on the conventional 17 inch by 14 inch (430 mm x 360 mm) sheet film. However, by viewing the 35 mm negative through a suitable magnifying viewer, experienced radiologists found that they could detect major abnormalities almost as easily as with the larger film.

New approaches to treatment were also being introduced. The most common intervention was known as artificial pneumothorax, where an incision was made in the chest wall to collapse a diseased lung. To maintain the collapse, nitrogen or compressed air was introduced into the pleural cavity. The theory behind this procedure was that a collapsed lung, being relieved of its breathing function, was given a chance to rest and recuperate. Patients could still live reasonably normally on the remaining active lung, but had to return to a clinic every six or eight weeks to have a ‘refill’ of the gas, a simple outpatient procedure.

When the Second World War erupted, the Australian military authorities decided that it was necessary to screen all recruits for tuberculosis before enlistment into the armed services. This was intended not only to weed out those who were unfit for active service, but also to prevent transmission of the disease to healthy personnel. Dr Wunderly and others continued their experiments to convince the medical establishment that miniature radiography on 35 mm film was a viable technique. Within two months, over 20,000 men had been examined in this way, and 109 cases of active

tuberculosis detected – one in every 183 recruits. Manufacturers soon modified their equipment so that a Leica or Contax miniature camera could be fitted, in addition to the conventional large-film magazine. This paved the way for many images to be made in quick succession on continuous film – ‘the celluloid strip’ referred to in the title of this paper. This experience prompted the Anti-Tuberculosis Association of NSW to acquire similar miniature equipment for screening the civilian population.

One problem encountered with using standard 35 mm cameras was that the film had to be wound forward manually after each exposure. During a busy period, this could result in inadvertent double exposures, or accidentally winding on more than one frame. Sometimes the film was finished before the operator realised this. If the frame numbers got out of sequence with the patient record cards, the wrong person would be recalled for further examination. Furthermore, it was easy for the camera focus to shift during film winding, so that all subsequent images were indecipherable.

By 1942 the Anti-Tuberculosis Association was in a position to conduct its first mass industrial survey, when all 830 members of the staff of Philips Electrical Industries came to the Albion Street Chest Clinic for X-ray. Following the example of Philips, other factories, shops and government departments began clamouring to be screened for tuberculosis. These surveys were paid for by the firm taking part. Philips had a vested interest in this project because they supplied the equipment, but as the war progressed, it became impossible to source further supplies from Europe. To meet the growing demand, in 1944 the Association ordered additional 35 mm X-ray

camera equipment from the Fairchild Corporation in the USA.

This duly arrived, but encountered a couple of unexpected hitches. Firstly, there was a waterfront strike in Sydney Harbour, and the wharf labourers refused to unload the crates. This difficulty was overcome through some deft negotiation, when members of the Waterside Workers’ Federation were promised the first screening survey using the new apparatus. Then, to the dismay of the Association, when the crates were unpacked it was found that the equipment consisted of modified aerial photography cameras using 70 mm film, instead of the 35 mm size ordered. None of the existing processing or viewing equipment could use the wider film, but wartime exigencies meant that returning the equipment and replacing it with the correct gear was likely to be a lengthy and uncertain process.

So the Anti-Tuberculosis Association decided to persevere with 70 mm film, and adapted its other equipment to suit. This size then became the de facto standard for all future mass X-ray screening in Australia, as a result of a simple clerical error in an American factory. One advantage was that, being twice the width of the 35 mm film, the image provided better resolution, and made the radiologists’ task easier. After the war, when Philips returned to the market they tried to promote a new film size – 40 mm, but in Australia at least they were unsuccessful. Later, 100 mm film was introduced for fixed, stationary installations, as an economical alternative to 17 by 14 inch sheet film.

Following the end of the Second World War, Australia enjoyed an unprecedented period of prosperity and confidence, with a buoyant economy based on worldwide de-

mand for primary products like wheat and wool. Having emerged victorious from the conflict, there was a widespread feeling that no goal was impossible to achieve. Some of the people at the Anti-Tuberculosis Association began to dream of an ‘X-ray plant on wheels’ that could provide a tuberculosis diagnostic service in major rural or urban centres, as well as the existing facility at the Chest Clinic in Surry Hills. Fundraising appeals organised by community groups in the Southern Tablelands yielded sufficient funds to translate that dream into reality. A standard Sydney single-deck bus was acquired, and fitted-out to the Association’s specifications, with space for a physician’s consulting room, a photographic darkroom, and storage for the delicate X-ray equipment in transit. On arrival at the selected location, the X-ray apparatus had to be removed from the bus, assembled indoors and connected to the electricity supply.

The first visit by the new mobile unit was to Goulburn in 1947, where over five thousand examinations were made. Participation was voluntary, with a fee of five shillings (fifty cents) charged to individuals, or ten shillings (one dollar) for a family group. Patients were required to partially undress, stripping to the waist – not an inviting prospect in a draughty country shire hall in mid-winter. Because of this, separate sessions for men and women were held each day. Films were processed on the spot and interpreted by the medical officer who accompanied the mobile unit.

In that euphoric spirit of postwar reconstruction, one of the rare amendments to the Australian Constitution was achieved in 1946, when the Commonwealth gained the power to legislate for the provision of medical services. Dr H. (later to become

Sir Harry) Wunderly was appointed Commonwealth Director of Tuberculosis to deal with the apparently intractable problem of reducing the damaging effects of tuberculosis on society. Dr Wunderly himself had been a tuberculosis sufferer who had spent some time in sanatoria, both in Switzerland and Australia. His first task as Director was to investigate existing provisions. Overall, they were poor – ranging from fairly good in Tasmania, to being almost non-existent in Queensland, and not much better in New South Wales. Wunderly estimated that there was a shortage of 3,200 hospital beds for tuberculosis throughout Australia, at a time when the total population was just over seven million.

Coincidentally, the long-awaited therapeutic breakthrough was occurring at the same time, with the release of two new ‘wonder drugs’ that seemed to promise a cure for tuberculosis. One was the antibiotic *streptomycin*, developed by Selman Waksman and his team of soil microbiologists in the USA. The other was *para-aminosalicylic acid* (PAS), prepared through chemical manipulation of the aspirin molecule by Jorgen Lehmann in Sweden. Although initial results for both therapies were very encouraging, it soon emerged that in some patients there were serious side effects, or more disturbingly, a relapse of the disease. It was apparent that the bacillus developed a resistance to these drugs unless they were used in combination. Even then, about twenty per cent of patients were not cured.

Isoniazid was synthesised in 1952 almost simultaneously in both Europe and America. This was more effective, had few side effects, and was cheap to produce. Once again, however, the tuberculosis bacil-

lus learnt to deal with the new drug, so chemotherapy took the form of a cocktail of all three drugs. During the 1960s a number of new preparations were developed, replacing both streptomycin and PAS, so that modern triple therapy usually consists of these newer drugs.

Thoracic surgeons were also becoming more adventurous in applying their wartime battlefield experience, and were removing diseased portions of lung, or even whole lungs, in selected patients. In other patients, a lung was collapsed by removing several ribs. These techniques stopped the spread of the disease, but could leave the patient disfigured or disabled. As the effectiveness of chemotherapy became evident, such radical surgery became unnecessary, so that the practitioners began to transfer their skills to the emerging discipline of cardio-thoracic surgery.

As Director of Tuberculosis, Dr Wunderly recommended measures for a concerted national campaign to control the disease. The concept of a common strategy had been agreed upon as early as 1911, but the First World War intervened before any action was taken. Then, in 1925, a Royal Commission on Health recommended that the States work together to deal with tuberculosis, but this time the proposals were thwarted by the Great Depression. So the Wunderly Report of 1947 in some ways was a repetition of what the experts had been saying for nearly forty years, except that this time the Government listened, and voted funds to begin a national campaign, whose aim in Prime Minister Ben Chifley’s words was ‘to reduce tuberculosis to a problem of minor importance within two decades’.

The essence of the Wunderly scheme

was that the States should be financed to engage in a program of early detection through compulsory radiography of all adults. This would be supplemented by a massive expansion of treatment facilities, because existing hospitals had extensive waiting lists. Finally, and despite objections from Treasury, an adequate pension would be payable to tuberculous patients while they were infective, to ensure that they followed the prescribed therapy. These principles formed the basis for the Commonwealth *Tuberculosis Act* of 1948, and the subsequent Tuberculosis Agreements under which the Commonwealth Government met all additional capital and operational costs incurred in tuberculosis control by the States, on condition that the services were provided to the public without charge.

New South Wales initially was wary about becoming involved, but eventually signed the Agreement in November 1949. The Anti-Tuberculosis Association of NSW was also invited to participate in the program because of its long involvement with tuberculosis diagnosis, prevention and cure, becoming the only non-government organisation in Australia to be offered this privilege. The Association formally became a partner in April 1952, and twelve months later was ready to begin its intensive case-finding project. Six additional mobile X-ray units were acquired to supplement the two buses already in service, and extra staff were recruited and quickly trained to operate this equipment. At the same time, the Association’s new purpose-built Clinic opened on the corner of Crown Street and Foveaux Street in Surry Hills, partially funded by the Commonwealth. This Clinic provided a comprehensive range of diagnostic and treatment services, including a

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twenty-bed hospital wing.

The new fleet of mobile units benefited from the experience gained in previous years, and the improved equipment then available. Compact 70 mm camera X-ray apparatus fitted comfortably into an eighteen-foot caravan that could be parked in front of a prominent public building such as a railway station or town hall. Patients could remain fully clothed, so there was no need to schedule separate sessions for women and men. Film cassettes were returned to the Association’s headquarters in Crown Street for processing. There, each photographic frame would be examined separately by two specialist radiologists, and if there was disagreement about interpretation, a third opinion was sought.

Some of the earlier technical problems had been overcome. Special cameras with fast, short-focus lenses having minimal optical aberrations were available. Large capacity film magazines were fitted, holding up to 400 frames instead of the 36 on a standard 35 mm cassette. More importantly, motorised film advancing mechanisms were linked to the X-ray control panel so that synchronisation was maintained, and the X-ray could not be taken unless there was film in the gate for the next exposure. Later still, the patient record card was photographed on the same frame, to avoid misidentification. It was almost foolproof, but a careless operator could still put the wrong record card in the reader, or forget to take it out between patients. Furthermore, an acceptable result depended ultimately on the quality of the film processing. Careless handling or exhausted chemicals could degrade the image.

To cope with the enormous demand for chest X-rays generated by the mass screen-

ing campaign, the mobile units began working a twelve-hour day, 9.00 a.m. to 9.00 p.m. from Monday to Friday, and sometimes on Saturdays. The staff attached to each unit normally worked in two shifts of three people. They were multi-skilled, and rotated the radiography, clerical and reception duties every hour. An experienced team could easily X-ray 800 people a day – better than one a minute. A mobile unit might be touring country regions for up to three months, followed by a three-month stint in suburban areas. This was a lifestyle which did not suit everybody, although some of the young operators relished the opportunity to move away from the parental home in the less permissive era of the 1950s.

Many incidents and tribulations accompanied these efforts. Mobile units had to traverse rough country roads, cross flooded rivers, cope with heat, dust, and torrential downpours, yet still provide X-ray services in a remote town on the advertised dates. An advance party had previously visited the area to arrange a site for the van, electricity connections, and publicity. They also had to enlist teams of volunteers to help the survey proceed smoothly. Members of Red Cross, Country Women’s Associations, Rotary Clubs and Boy Scouts were amongst the many recruits who assisted with clerical work.

Every person examined received a response from the Association within three weeks. For most people, this was merely a card to advise that no abnormality existed. If further investigation was needed, the person received a notice to attend the Association’s Clinic or a major regional hospital for a larger X-ray and other tests to confirm the diagnosis. In later years, the service was improved by equipping a sepa-

rate mobile unit for taking large X-rays, and this unit visited many of the smaller centres about three weeks after the initial screening, accompanied by a travelling medical officer who would follow-up doubtful cases.

With the rapid expansion of the service in 1953, it was clear that the Anti-Tuberculosis Association of NSW would never be able to mobilise sufficient resources to cover the whole population with regular surveys. The Division of Tuberculosis within the NSW Department of Health gradually developed its own facilities for community X-ray surveys, based closely on the Association’s model. To rationalise the itinerary, the Association agreed to take responsibility for the northern and north-western areas of New South Wales, while the Department took care of the remainder. Similarly, municipalities in the Sydney metropolitan area were shared between the two agencies, with the State’s population divided in the ratio of one-third to the Association, two-thirds to the Health Department.

The procedures and equipment that had been developed by the Anti-Tuberculosis Association of NSW also provided a model for the compulsory campaign in other States, where the service was conducted solely by the respective State Health Departments. For three months, NSW stationed some of its mobile units in Melbourne to provide a pilot scheme for the Victorians. Ultimately, there were about thirty chest X-ray caravans working throughout Australia. Surveys in Federal Territories such as the Northern Territory, A.C.T., Nauru and Christmas Island, were conducted by the Anti-Tuberculosis Association of NSW, under contract to the Com-

monwealth Government.

As the campaign continued, better equipment became available. The most notable improvement was the introduction of the ‘Odelca’ mirror camera. This was based on the principle of the Schmidt camera used in astronomy, where a spherical mirror is used instead of a lens system to form the optical image. Although this is a rather bulky device, it is much faster and gives better sharpness over the full field.

Although the Wunderly Report recommended that every person over the age of fourteen should be required by law to present for X-ray examination, at first both New South Wales and Victoria were reluctant to implement the sanction of fines for non-compliance. Their stance seemed vindicated in the first survey, where it was common in many areas for 85 per cent of the adult population to present for X-ray. In some western towns of New South Wales, the number of X-rays exceeded the official population statistics. Presumably, people were travelling long distances from outlying settlements.

On the other hand, the fact that the remaining 15–20 per cent of the population were not being examined was a concern, because it was likely that a proportion of these knew or suspected that they may have tuberculosis, and consequently avoided the X-ray examination.

Initially, the results of mass screening were impressive, as the notifications of new tuberculosis cases in Metropolitan Sydney show (Figure 1). The number attending usually declined when the mobile units made return visits two or three years later, probably because people became apathetic after being cleared on their first X-ray.

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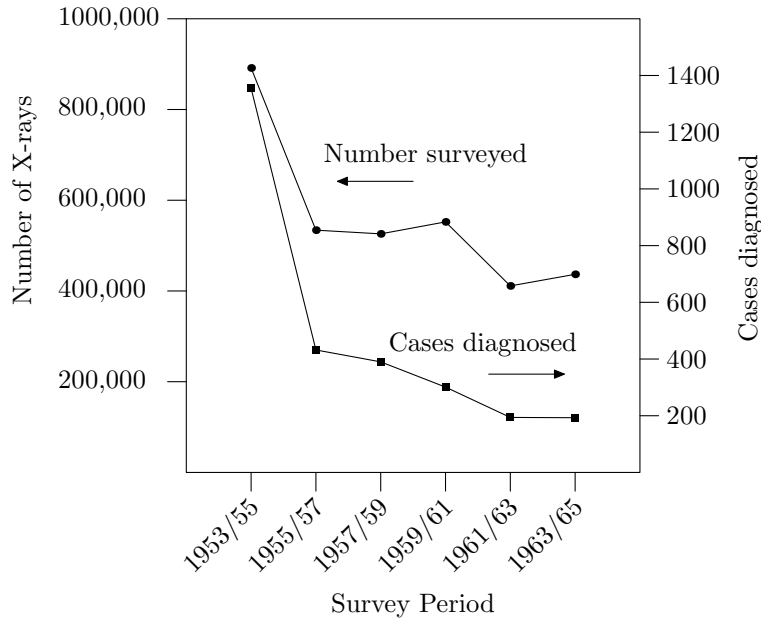


Figure 1: Successive TB surveys in the Sydney metropolitan area.

In 1956, the State Government yielded to Commonwealth pressure, making X-rays compulsory, and imposing a fine of £20 for failing to attend when the mobile X-ray units visited a proclaimed district. A further penalty of two pounds a day could be incurred for every day that elapsed before the defaulter presented for an X-ray. A few ‘show trials’ took place to convince the populace that the government was serious.

In the twenty-five years between 1950 and 1975, the Anti-Tuberculosis Association took eleven and a half million chest X-rays, using about 900 kilometres of film – a very long ‘celluloid strip’. As a result of the surveys, 8 854 new cases of tuberculosis were detected, as well as many inactive cases. To these figures we must add the parallel efforts of the NSW Department of Health. The totals may be a little exaggerated, because there could have been a certain amount of over-diagnosis, as the

clinicians would be prone to classify doubtful cases as tubercular, particularly with their own continued employment at stake. Subsequent testing would have confirmed which patients were infected, but the statistics were not adjusted.

Overall, the campaign detected only one case of tuberculosis for every 1,300 X-rays taken. However, this rather small statistical average overlooks the marked discrepancy in cases between different areas. For example, there was one positive diagnosis for every 350 X-rays taken at the Crown Street Clinic. This difference is explained by the fact that many of those presenting at the Clinic already had symptoms and were referred by their private doctor, or they were contacts of known tuberculosis patients.

What these statistics do not reveal is that many other serious abnormalities were detected at the same time, particularly heart conditions or lung cancer. By 1959,

such pathologies already exceeded the detection of new cases of tuberculosis. These were referred to private practitioners or public hospitals for further investigation and treatment. In retrospect, this part of the campaign may have been more significant for the long-term health of the population than identifying the relatively few tuberculosis cases.

Because the number of tuberculosis cases was declining, a rationalisation of the mass radiography program in New South Wales took place in 1971. The NSW Department of Health withdrew from the statewide surveys, and transferred its mobile X-ray units to the Anti-Tuberculosis Association, together with some of the operational staff and funding to continue the program. To further reduce costs, the interval between surveys extended to an average of five years. The minimum age for compulsory X-rays was raised from twenty-one to twenty-five years, with an increase to thirty-five years soon afterwards.

At first, nobody asked publicly whether the benefits justified the cost of the national campaign, but the reality is that it was a very expensive exercise. The total Commonwealth expenditure on the program between 1950 and 1977 was \$361 million, which of course would be many times that sum at today's prices. In 1977, the Anti-Tuberculosis Association published for the first time the actual costs incurred in producing each 70 mm diagnostic film image. In the metropolitan area this amounted to eighty cents per head, but in regional areas it was twice as expensive, at \$1.64 per head. The difference was due to travel and accommodation costs for staff. From nearly a quarter of a million X-rays taken in that year, only 55 cases of tuberculosis were di-

agnosed, costing somewhere in the vicinity of \$5,000 for each case notified. Subsequent treatment costs presumably would have been much greater,

It was becoming obvious that the law of diminishing returns applied. Indeed, it seemed that Ben Chifley's ambition to reduce tuberculosis to a minor problem within two decades had been achieved, so it is not surprising that the Commonwealth Government led by Malcolm Fraser decided to revoke the Tuberculosis Agreement with the States, taking effect from the end of 1976. In retrospect, this may have been a premature decision, occurring just as an increasing number of 'boat people' refugees from the war in Vietnam began settling in Australia. Tuberculosis was endemic in their homeland, and they brought a new locus for the disease to their adopted country. Of course, the way remained open for the State authorities to finance their own control programs, but they were reluctant to divert funds from other responsibilities.

The apparent success of the Australian Tuberculosis Campaign is confused by the fact that streptomycin and similar therapeutic agents were introduced almost concurrently with the commencement of the campaign. Effective treatment that could be administered at home or in a hospital outpatient department quickly rendered many of the new sanatoria and chest hospitals redundant. Certainly, the mass screening surveys still played a useful role in case-finding, identifying patients who could be referred for prompt treatment. In doing so, potential sources of infection were removed from the broader community.

However, it would be presumptuous to claim that the lowered incidence of tuberculosis in Australia was due to the implemen-

tation of a compulsory, nation-wide screening program, for the decline in notifications commenced long before the campaign (see Figure 2). With some fluctuations, the trend had been declining steadily for a hundred years. This fact poses some interesting questions. We cannot attribute all of the decline to improved treatment, because effective chemotherapy did not arrive until the late 1940s, so it must be due to other causes. A number of possible factors have been identified, but it is difficult to apporportion the relative significance of each. Reticulation of pure water and efficient sewer-

age disposal in the late nineteenth century were accompanied by heightened awareness of personal hygiene. Increased prosperity led to better housing and nutrition. Smaller families resulted in less overcrowding. These elements combined to reduce exposure to risk, and possibly generated improved resistance to the disease. It is also conceivable that there has been a reduction in the virulence of the bacterium during this period. Chemotherapy did make an impact on the death rate, although this also had been improving steadily since the Great Depression.

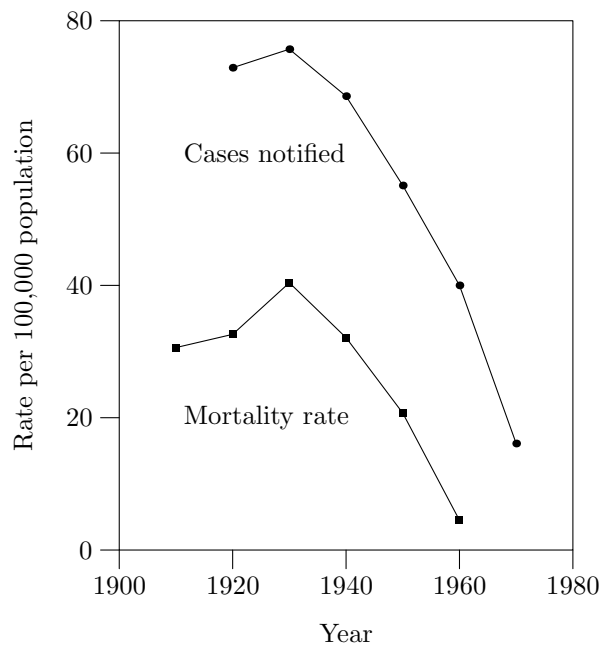


Figure 2: Incidence of TB in NSW.

The campaign continued at a reduced scale after Commonwealth funding was withdrawn, but from 1979 it was no longer compulsory, although people over thirty-five were still encouraged to have regular X-rays. Under these circumstances, it was in-

evitable that mass screening of whole communities would soon cease. Government health authorities decided that tuberculosis detection in future would concentrate on high-risk sections of the community. In 1981, the Health Commission of NSW gave

the re-named Community Health and Anti-Tuberculosis Association six months' notice that it was terminating its arrangement with the Association to provide mass radio-

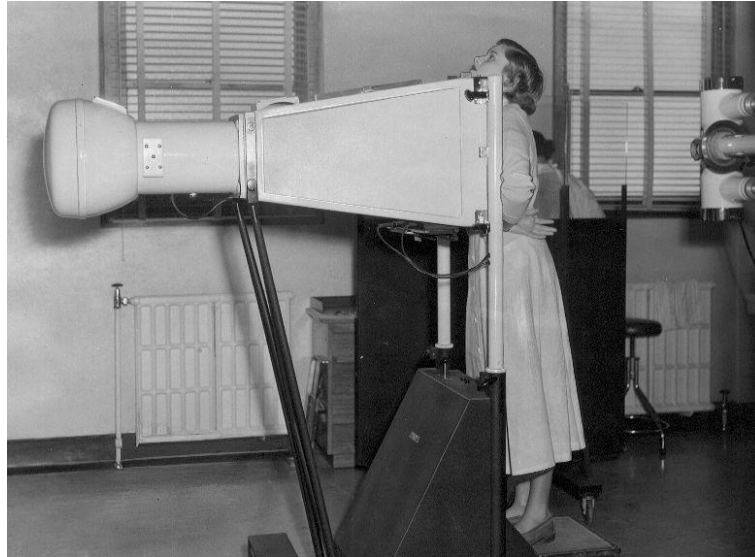
graphic surveys.

The ubiquitous X-ray caravans then disappeared from street corners around New South Wales.



A Mobile Xray Bus at Mudgee. The original mobile X-ray units travelled in a converted Sydney bus, which included space for a photographic darkroom and a radiologist's consulting room. The large X-ray machines of this era had to be unloaded from the bus and set up in a building, usually the local Town Hall.

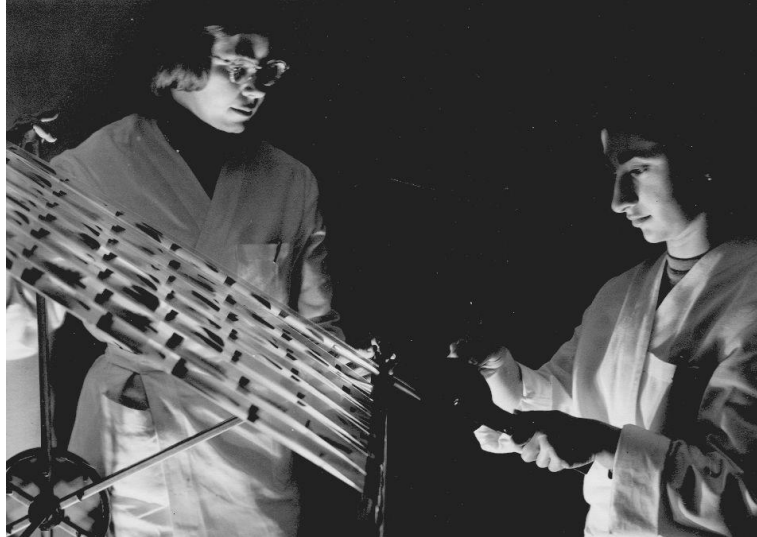
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Improvements in equipment resulted in shorter exposure times and better images. This illustration is of an Odelca mirror camera installed in the Sydney clinic of the Anti-Tuberculosis Association. Similar gear was used in mobile units towards the end of the national campaign.



An Anti-Tuberculosis Association mobile X-ray unit. These large caravans were placed in prominent suburban locations for periods from a few days to several months. Each caravan included a small office for registering the client's personal details, as well as the miniature X-ray equipment.



Processing the Celluloid Strip Miniature X-rays consisted of 400 separate images on a single length of 70 mm photographic film - "the celluloid strip". Films were returned from the mobile units to a central location for processing. Here technicians are inspecting a film before it is handed to the medical staff for diagnostic examination.

SHIRE OF DUNGOG		
DUNGOG	Dowling Street	24th June-29th June
EAST GRESFORD	Park Street, near P.O.	30th June only
PATERSON	Outside Bevans Store	1st July only
MUNICIPALITY OF TAREE		
TAREE	Pulteney Street (off Victoria Street) outside A.M.P. Building	6th June-29th June
REMEMBER :—CHEST X-RAYS ARE COMPULSORY		
Hours: 9.30 a.m.-8.30 p.m. Monday to Friday 9.30 a.m.-12.30 p.m., Saturday		
NO CHARGE—NO UNDRESSING		
	YOU MAY WEAR: Plain Cottons, Plain Woollens and Plain Rayons.	
	DON'T WEAR: Nylons, Silks, Medallions, Hand Painted Ties, Dresses with Sequins, Dresses with Beading, Bras of Foam Rubber.	
ANTI-T.B. ASSOCIATION		

This is a poster announcing a forthcoming visit to country towns by a mobile X-ray unit. The slogan 'No Charge - No Undressing' indicated a notable change from the early days of mass population surveys, when a small charge was levied, and clients had to strip to the waist. There were still some restrictions on the type of clothing that could be worn.

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