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'A long want': an archival exploration of scurvy in the Otago goldfields of New Zealand

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ABSTRACT

In this paper we test a long-held assumption regarding Otago, New Zealand, goldfields life and death- that scurvy was a ubiquitous and persistent cause of misery and death among the goldminers. We will also explore a parallel argument that the Chinese market gardeners played a large role in stamping out the disease in the goldfields. Through the interrogation of various archival medical primary sources, we show that scurvy was indeed a terrible scourge in the Otago goldfields, but only during the initial rushes into new regions. We also argue that while Chinese market gardeners undoubtedly contributed to a more nutritious and varied diet for European miners and settlers, scurvy had already markedly reduced in frequency by the time of their arrival in the gold fields. Patient-oriented accounts of scurvy in the gold demonstrate the clinical and functional cost of scurvy in during the initial gold rushes of Otago. Furthermore, individual stories of previously anonymous patients found locked in these archival sources demonstrate the importance of re-humanising the past to understand the biological and social context of these frontier times.

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Introduction

In this paper we will test a long-held assumption regarding goldfields life and death in Otago, New Zealand - that scurvy was a ubiquitous and persistent cause of misery and death among the goldminers. We will also explore a parallel argument that the Chinese market gardeners played a large role in stamping out the disease in the goldfields.

Vincent Pyke (1887) describes his 1862 visit to the Dunstan Hospital …

> The hardships which the miners had to endure in the early days of the Dunstan were very great, not the least being the entire absence of fresh vegetable food. Flour and bacon were the most portable provisions, and on these they chiefly subsisted, with the consequence that, like sailors in similar circumstances, they began to suffer from scurvy. (Pyke 1887, p. 104)

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Our understanding of health on the goldfields is largely limited to retrospective historical accounts (e.g. Pyke 1887; Fulton 1922) that have yet to be tested with information from primary sources, such as hospital and death registers. While primary sources of health and disease information from this period are very rare, some are still extant. To our knowledge these have yet to be mined for patient-oriented disease information.

From our interrogation of various primary sources, we will show that scurvy was indeed a terrible scourge in the Otago goldfields, but only during the initial rushes into new regions. The fact that Chinese market gardeners contributed significantly to the nutritional status of the overall population has been well established (Ng 1993, pp. 320–324). However, we will also demonstrate that by the time the Chinese market gardeners were in full production, scurvy had been all but eliminated from the general adult population. As scurvy is a disease largely of the distant past, we will delve into the health and social consequences for the afflicted at a time in New Zealand's history when governmental support for those unable to work was essentially non-existent.

This context of disease will be approached from a biosocial perspective. This theoretical framework recognises that biology, environment, and sociocultural practices interact to result in the overall disease impact. In addition, the bioarchaeology of care approach is followed to ascertain the implications of disease for both the individual patient and the wider communities within which they resided in Otago. This approach is based on World Health Organization's standard essential elements of care and translates an individual's clinical and functional limitations into the context of required care for the individual's survival (Tilley 2015). Originally designed for individual case studies, efforts to consider the impact of healthcare on a population level have also recently emerged in the literature (Tremblay and Schrenk 2022).

Brief history of medical care for the Otago miners

In the early 1860s, the influx of people engaged in mining into the wider Otago region necessitated a need for the establishment of Provincial hospitals to service the health needs of the growing population. Dunedin Hospital had been operating since the 1850s but was overrun when the gold rush commenced (Angus 1984) and thousands of (mostly) men rapidly moved out of the city in search of gold, beginning in Tuapeka in 1861, and extending further into 'central' Otago over the next two to three years.

The Tuapeka Goldfield Hospital at Lawrence was the first country hospital established and was opened in 1861–1862 under the direction of Dr Hulme from the Dunedin hospital (Angus 1984). This institution and those that followed were established by a joint arrangement of subscribers and government funding. There are no extant records of the patient register from the Tuapeka Goldfield Hospital.

A new hospital at present day Clyde was opened in late 1863, known as the Dunstan District Hospital. Prior to this time, a Dr Jackson had been treating miners' ailments, dispensing medicines, and had built an eight-bed temporary facility to cater for the influx of miners to the Dunstan goldfields (Angus 1984). Over the next 10 years similar institutions were opened in Frankton (1863), Wakatipu (1863), Naseby (1871), Cromwell (1873), and (Angus 1984).

Reporting of the Hospital committees in the local newspapers are frequent and largely concerned with fiscal aspects of the day to day running. The surgeons' reports are often

noted and the number of patients in and out reported. Unfortunately, these reports rarely give details of the conditions suffered by the patients and the original surgeons' reports are, largely, no longer extant. Similarly, the excellent historical works of the likes of Angus (1984) and Fulton (1922) offer few details of individual patients and their conditions. Extant records of patient registers for these hospitals are very rare. To our knowledge, the only one still in existence is that of the Dunstan District Hospital.

A brief history of medical knowledge of scurvy

Historically, scurvy is best known from the days of long-distance sea voyaging when there was no understanding of the importance of Vitamin C rich foods to maintain the health of sailors.

Between 1768 and 1771AD on Captain Cook's first Australasian voyages, a third of his crew was lost due to scurvy-related deaths (Mellinkof 1995). It has been argued that 'between 1500 and 1800AD, more seamen died of scurvy than all other causes combined, including other diseases, shipwreck, accident, and battle' (Mellinkof 1995, p. 367).

While the death toll among seamen related to scurvy had been terrible since the beginning of long sea voyages, it was not until Captain James Cook returned from his first maritime explorations of New Zealand and Australia that remedies for the disease began to be explored. In response to the devastating loss of life in his first voyages, Captain Cook took great pains to improve the living conditions (including diet) of all his crew on his second voyage in 1772–1775. At this time, the cause of scurvy was thought to be a consequence of constitutional weakness, a disturbance of the 'humours', and potentially transmitted through kissing (Mellinkof 1995). Captain Cook introduced sauerkraut into the diet of his crew, based on his observation that fewer Dutch sailors were afflicted with the disease, and he lost only one of his crew in this voyage. However, prior to Cook's voyages, in 1747, James Lind a young Navy ship's surgeon, conducted the first controlled experiment of treatment of the disease where two of the 12 patients given two oranges and a lemon daily, fully recovered within six days and were the only patients to recover completely. Despite this success, and an understanding that a lack of fresh fruit and vegetables was a common cause of scorbutic attacks, it took 48 more years for the British Navy to adopt a policy of providing lemon juice to their sailors. It was not until 1795, a year after Lind's death, that the British Navy provided an ounce of lemon juice to all their sailors (Mellinkof 1995).

At the time of Lind's 'Treatise of the Scurvy' published in 1753, few believed that scurvy could occur 'on land' (to which he disagreed) (Lind 1753, p. 168), but it was certainly a serious threat to life in the early gold fields period. Small populations of men essentially stranded in the barren and harsh landscape of central Otago could conceivably be likened to 'being at sea'.

An account of scurvy disabling miners at the remote Skipper's Gully in the Wakatipu area in July 1863 vividly describes this analogy;

> A correspondent, writing from Skipper's Gully, on the 16th instant, says:-The prevalence of scurvy in this place is frightful, and every day fresh victims are added to the list of sick. We can scarcely obtain anything here but rusty bacon and flour, without the sign of any vegetables; and this, with the constant exposure of every inclemency of the weather, will affect the strongest constitution. There are three I saw the other day in a dreadful state,

> unable to move or speak, whose condition I will not trust my pen to write, for fear you should think I am exaggerating; but leave your imagination to picture the direst form of that terrible disease, aggravated by neglect. (Lake Wakatip Mail, 25 July 1863, p. 4)

The correspondent goes on to name three men in a sorry state, in the hopes friends and family may assist. The state of the roads, being effectively impassable, was blamed by many for causing such high levels of disease and privation. In June of 1863 at a 'monster meeting' of the inhabitants of the Shotover and Queenstown, the community begged the provincial government for assistance with infrastructure and Police to help stem the general lawlessness; A. Bergen recounted a story:

> On his way up he was distressed at seeing a man carried on a stretcher by his six mates, evidently suffering great pain. On enquiry he found the poor fellow exhausted by rheumatism and scurvy, and owing to the dangerous state of the roads he could not be brought down on a horse. What crime had the Victorians committed that they should be denied the privilege of roads, medical aid and protection? (Lake Wakatip Mail, 6 June 1863, p. 4)

The pathophysiology of scurvy

Scurvy is a nutritional disease caused by deficiency of Vitamin C (ascorbic acid). Vitamin C is not produced in the human body, so we are entirely reliant on dietary intake (Hirschman and Raugi 1999; Keenan et al. 2002; Linster and Van Schaftingen 2007). The vitamin is an essential component of several cellular processes including reversing oxidisation from free radicals which cause disease in the body. Vitamin C is also an important contributor to the synthesis of collagen production, an essential building block of connective tissue (Linster and Van Schaftingen 2007). The consequence of Vitamin C deficiency leads to a breakdown of bodily tissues that rely on collagen for structural stability, including blood vessels, skin, muscular tissue, and bone (Hirschman and Raugi 1999). Increased risk of more severe infectious disease is another consequence (Wintergerst et al. 2006) of relevance to the pre-antibiotic era.

It is important to note that scurvy as a disease is characterised by the extreme end of the deficiency spectrum. At this stage, an individual has likely been receiving less than 10 mg a day of Vitamin C over a period of several months (Hirschman and Raugi 1999). Common signs include superficial and deep tissue haemorrhaging visible as small papule-like rashes across the skin surface, bleeding gums (and eventual tooth loss), and severe joint pain due to bleeding into joint capsules (Lewis et al. 1998; Hirschman and Raugi 1999). The scars of healed wounds can re-open and the pain of vessel rupture at muscle attachment sites and within joints leads to difficulty in walking (Ralli and Sherry 1941; Weary et al. 1961). The disease is cured rapidly with the re-introduction of dietary Vitamin C into the body.

Scurvy in the nineteenth century consciousness

The symptoms of the disease are described below as they were understood at the time, rather than modernising the terms, as this is how the patients would have experienced the narrative around the disease. A diagnosis of scurvy in the nineteenth century would have meant the person presented with a very pale and bloated face. They would have been displaying signs of spotted haemorrhage under the skin, so called purpura

Figure 1. Patient with characteristic purpural haemorrhagic skin lesions of scurvy. Source: St Bartholomew's Hospital Archives and Museum, Wellcome Collection.org, Attribution 4.0 International (CC BY 4.0).

(Figure 1), with softened and bleeding gums, loss of teeth, and tight, swollen, very painful limbs. Graphic descriptions of scurvy in sailors may also be applied to miners' experiences in the early rush days:

> long want, improper food, grief, melancholy, cold etc; and the symptoms … …; such as gums monstrously putrid, swelled legs, livid blue spots and hardnes [sic] on the body, contracted limbs, the scorbutic deliquium, often ending in the most sudden and unexpected death, fluxes and haemorrhages of all sorts etc. (Lind 1753, p. 311).

The livid blue spots and hardness on the body describes the effects of haemorrhaging in tissues under the skin. It should be acknowledged that purpura is also now recognised as a symptom of other platelet and vascular disorders (e.g. Thrombotic thrombocytopenic purpura, Murrin and Murray 2006) which may account for some cases of misdiagnosis by the nineteenth century physicians.

How a scorbutic person felt and their (in)ability to function is also described by Lind and provides a vivid picture of the functional cost of the disease to those affected;

> in the case of scorbutic people, it is somewhat singular, and peculiar to them, that though when at rest they find themselves quite well; yet, upon the least exercise, they are subject, at first, to a panting and breathlessness, which, as the disease increases, degenerates into a proneness to faint; and lastly, in the height of the malady, upon using exercise, or and exertion of their strength, or upon being exposed to a sudden change of air, they are apt to drop down dead. (Lind 1753, p. 320)

Sudden and unexpected death was likely due to heart failure in response to blood loss but was interpreted by Lind (1753) to be due the scorbutic inability to excrete 'chyle' or perspiring humour (Lind 1753). It is now understood to be due to the extreme anaemia associated with blood loss that puts pressure on the heart, causing breathlessness, fainting and eventual death (Hirschman and Raugi 1999).

Materials and methods

Primary archival sources of patients and deaths

Here we use patient information from three primary sources for evidence of scurvy in the miners and general population. Firstly, the Dunstan Hospital Patient Register (DHPR) (1864-1884) is the largest and most important primary source of information (Archives New Zealand. DHPR. D369. Item 25a n.d.). The importance of the DHPR for addressing the aim of this paper is primarily that it captures the period at the height of the 'frontier' push for gold just two years after Gabriel Read's initial discovery in 1861 and one year after the rush in the Dunstan region. By necessity, the catchment area of the Dunstan Hospital (demonstrated by patient information of residence) was initially very wide, stretching to Lake Hawea in the northwest, the Arrow to the west and the modern-day Roxburgh area to the south (Figure 2). The demographic details of the patients and other health conditions will be dealt with in forthcoming papers, but the locations within the catchment area consisted of ephemeral 'frontier' settlements, remote gullies, streams, and fields of the gold diggings, although people from the Runs and Stations were also admitted.

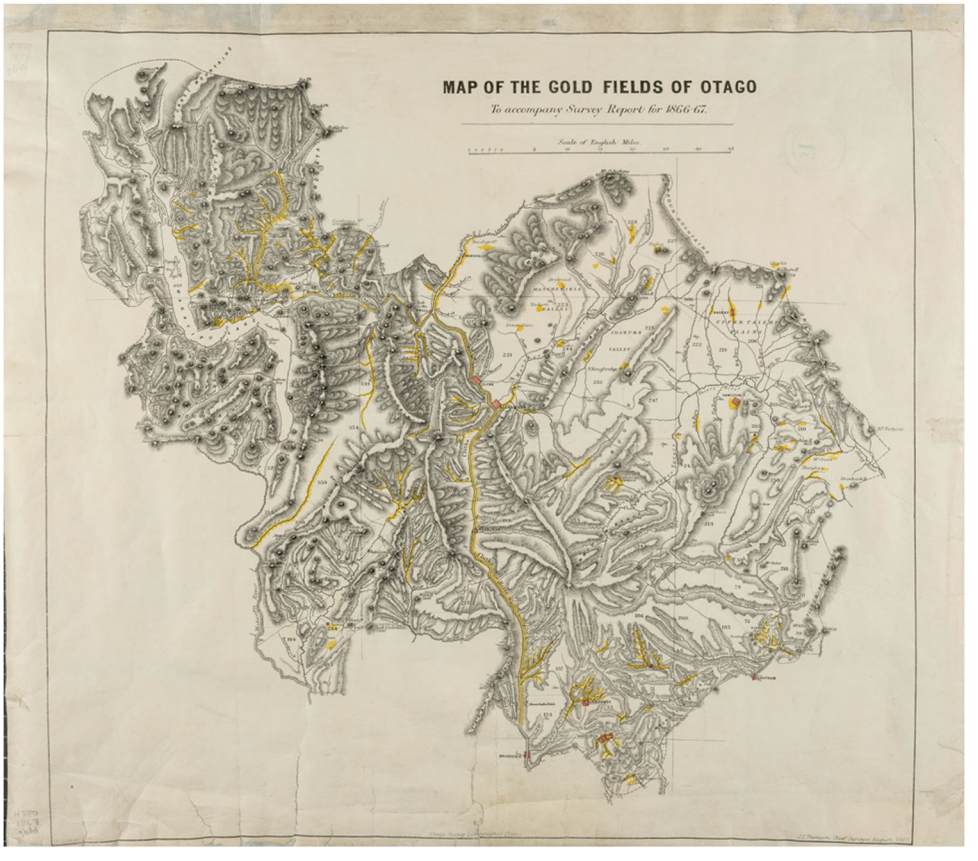


Figure 2. Map of the gold fields of Otago to accompany survey report for 1866–1867 (Dunedin: Otago Survey Lithographic Press, 1867). Reproduced with permission of the Hocken Collections, Uare Taoka o Hākena,University of Otago

The second source is the Dunedin Hospital Casebook (Vol II) (DHCB) covering the period 1864–1869 (Archives New Zealand. DHCB. D267. Item 7a n.d.). The casebook provides patient information from the population of the infant city and wider region. The resident Provincial surgeon was Dr Edward Hulme, who served at the hospital from 1864 (Angus 1984). The DHCB Vol II includes miners admitted from the various Clutha and Otago goldfields and offers a fascinating glimpse of the inhabitants and transient international visitors to a city on the edge of the massive British Empire, including seamen entering port from all corners of the empire.

Death registers from Gabriel's Gully (1863-1875; 1876-1887; 1887-1889) (Archives New Zealand. D484. Series 3712 n.d.. Items 685, 122 and 123), Dunstan (1863-1875) (Archives New Zealand. D484. Series 3747. Item 682), Cromwell (1868-175) (Archives New Zealand. D484. Series 3753. Item 71 n.d.), and Manuherikia (early Alexandra) (1866-1875) (Archives New Zealand. D484. Series 3718. Item 71 n.d.) are also explored for cases of scurvy-related deaths.

For all these sources we searched for the words 'scurvy'and/or 'scorbutus' as terms used by the colonial physicians as a diagnosis of vitamin C deficiency causing the

disease. It is only in the DHCB that symptoms such as purpura are described in patients, but these are always qualified with a primary diagnosis of scurvy.

Results and discussion

Primary archival evidence of scurvy in the Otago goldfields

Dunstan Hospital Patient Register 1863–1864

The patient register begins with a round up and classification of diseases from July to 31st of December 1863. This consists almost entirely of outpatients, as the hospital only officially opened to in-patients in 1864. There is a note on the page: 'A considerable number of outpatients were cases of scurvy, rheumatism, catarrh and colonial fever' but the patient numbers are not given for this period. In 1864, 227 in-patients and 83 out-patients were seen at the hospital. Twenty-five of these were treated for scurvy or 'scorbutus', the term commonly used in the register (Table 1 and Table 2). All of those affected were men and while their occupation was not recorded it is highly likely they were engaged in mining.

In January 1864, ten of the men were treated as in-patients while seven were out-patients. The records for this year of the register are very patchy and it is difficult to precisely quantify the number of admissions. For example, John Tie, a 25-year-old Irishman working in Kawarau was seen as an outpatient on the 29th of January. However, there are also two records of him being admitted for 'rheumatismus of scorbut' earlier in the month of January (Archives New Zealand. DHPR. January 1864, In-patient entry 42. Out-patient entry 41). He was admitted on the 14th of January for a total of 10 days and then readmitted 4 days later and spent another 14 days in hospital in February for the same condition (Archives New Zealand. DHPR. February 1864, In-patient entry 16).

In February of 1864, there were two records of new scurvy patients, one inpatient and one outpatient. Then in March Michael Dungan was the only scurvy patient admitted and was discharged on the 11th of July after 129 days in hospital (Archives New Zealand. DHPR. July 1864, In-patient entry 4). There was only one death recorded in the DHPR as the result of scurvy; Thomas Lloyd, a 42-year-old Welsh man working in Manuherikia. He was admitted on the 22nd of December 1863 and died on the 2nd of February 1864 (Archives New Zealand. DHPR. February 1864, In-patient entry 6). Thomas was in hospital for 103 days before his death. He was being treated for 'scorbutus bronchitisque'. Two other men were seen as outpatients at the end of 1863.

From August (after Dungan was discharged in July) to December of 1864 there were no further cases of scurvy recorded. In fact, there were no further cases of patients admitted for scurvy in the remaining 19 years of the register. It is possible however that scurvy was still being treated in outpatients after this point but while the numbers of outpatients are noted, the conditions being treated were not. It is also possible that sub-clinical or less severe cases were managed in the community and did not require hospital treatment.

Clinical and functional implications for patients

For most of these patients the symptoms would have been similar to those described by Lind above, with a range of severity. It is probably safe to assume that if these men were

Table 1. Biographical details of in-patients with scurvy admitted to the Dunstan District Hospital.

Admitted	Name	Sex	Age	Country	Religion	Employed at	Disease	Result	Duration in (days)	DHPR source (patient number)
December										
2/12/63	Thomas Lloyd	M	42	Wales	Prot	Manuherikia	Scorbutus Bronchitisque	Died 2/2/64	103	6
January										
02/01/64	John Cowell	M	35	Scotland	Prot	Kawaru	Scorbutus	Recovered	22	59
02/01/64	Charles Brown	M	29	Sweden	Prot	Nevis	Scorbutus	Recovered	44	54,19(eb)
04/01/64	John Tie	M	25	Ireland	RC	Kawaru	Rheumatismus of Scorbutus	Recovered	24 (2x admissions)	42,16
05/01/64	John Simpson	M	40	England	Prot	Manuherikia	Scorbutus	Recovered	17	60
05/02/64	John Robinson	M	27	England	Prot	Manuherikia	Scorbutus	Recovered	24	31
06/01/64	William Harper	M	34	Ireland	RC	Hogburn	Scorbutic synovitis	Recovered	39 see OP table	15
12/01/64	George James	M	23	England	Prot	Teviot	Scorbutus	Recovered	14	63
16/0164	Thomas Lowe	M	32	Ireland	RC	Frazers	Rheumatism of Scorbutis	Recovered	31	21
23/01/64	James Thomas	M	39	Wales	Prot	Hogburn	Scorbutus	Recovered	24	20
27/01/64	Peter Wyles?	M	30	Scotland	Prot	Campbells Gully	Scorbutus		32 also registered as OP on same date	2
February										
06/02/64	John Brown	M	NR	Scotland	Prot	Hamiltons	Scorbutus	Recovered	33	5
March										
04/03/64	Michael Dungan	M	19	Ireland	RC	Kawarau	Rheumatic scorbutic synovitis	Recovered	129	

DHPR = Dunstan Hospital Patient Register; Prot = Protestant, RC = Roman Catholic; NR = Not recorded; IP = In-patient; OP = Out-patient.

Table 2. Biographical details of out-patients with scurvy admitted to the Dunstan District Hospital.

Admitted	Name	Sex	Age	Country	Religion	Employed at	Disease	Result	Duration of disease	DHPR source (patient number)
December										
31/12/63	WB Gordon	M	NR	NR	NR	Campbell's Gully	Scorbutus	Recovered	34 days as OP	23
31/12/63	John Lyons	M	NR	NR	NR	Campbell's Gully	Scorbutus	Recovered	32 days as OP – other admissions prior non-scurvy	24
January										
01/01/64	William Harper	Male	34	Scotland	RC	Hogburn	Scorbutic synovitis	Recovered	See IP table	50
03/01/64	John Patterson	M	NR	Ireland	NR	Miller's Flat	Scorbutus	Recovered	33 days	1 (in Feb Op pages)
08/01/64	Joseph Norman	M	NR	England	NR	NR	Scorbutus	Recovered	6 weeks	54
08/01/64	George Bilfrow	M	NR	England	NR	Millers Flat	Scorbutus	Recovered	2 months	55
15/01/64	Hugh Riley	M	NR	Ireland	NR	Nevis	Scurvy	Recovered	5 weeks	50
19/01/64	Patrick Monagan	M	NR	Ireland	NR	NR	Scorbutus	Recovered	Not recorded	63
21/01/64	David Josephs	M	NR	England	NR	NR	Scorbutus	Recovered	Not recorded	64
23/01/64	Archibald Cammeron	M	42	Portland USA?	Prot	NR	Scorbutus	Recovered	1 d	45
29/01/64	John Tie	M	25	Ireland	RC	Kawarau	Rheumatismus of Scorbutus	Recovered	See IP table	OP entry 41
February										
01/02/64	Donald Thomas	M	NR	Scotland	NR	Serpentine	Scorbutus	Recovered	25 days as OP	10

DHPR = Dunstan Hospital Patient Register; Prot = Protestant, RC = Roman Catholic; NR = Not recorded; IP = In-patient; OP = Out-patient.

admitted, their symptoms must have been on the more extreme end of the scale. An affliction with scurvy not only came with the severe fatigue described above, but a loss of limb function due to haemorrhaging into muscle tissue and joints would also have occurred. The 'rheumatismus of scorbutis' noted for two of the patients is likely describing the pain associated with bleeding into the joints, as 'rheumatism' generally denotes joint pain.

The rheumatismus of scorbutus for which John Tie was admitted could have presented as Lind describes, where following the pale and bloated face and a general aversion to work and exercise;

> their former aversion to motion degenerates soon into a universal lassitude, with a stiffness and feebleness of their knees upon using exercise; with which they are apt to be much fatigued, and upon that occasion subject to a breathlessness or panting. (Lind 1753, p. 149)

Today an inflammation of the synovium, the membrane lining a synovial joint capsule, has multiple aetiologies and is termed 'synovitis'. How synovitis was recognised in the nineteenth century is difficult to discern, but two of the patients are recorded with 'scorbutic synovitis' in the register. William Harper, a 34-year-old Scottish man working at Hogburn was initially seen for scorbutic synovitis as an outpatient and then admitted. He spent 39 days in and was discharged on the 14th of February. Lind (1753, p. 162) describes symptoms which may have been diagnosed as the synovitis associated with scurvy:

> In the second stage of this disease, they most commonly lose the use of their limbs; having a contraction of the flexor tendons in the ham, with a swelling and pain in the joint of the knee. Indeed, a stiffness in these tendons, and a weakness of the knees, appear pretty early in this disease, generally terminating in a contracted and swelled joint.

Despite the cure for scurvy being well understood in the 1860s many of these patients had prolonged stays in the hospital. As noted, the records are very patchy in 1864 but for several the outpatients the duration of time the men had been sick with scurvy prior to examination by a doctor was noted. For example, George Bilfrow (age not recorded) was an English man working at Millers Flat who had been ill with scorbutus for over 2 months before being seen at the hospital.

Time and space of scurvy patients- relationship to the Dunstan and Mt Ida Rushes

The scorbutic patients were recorded as having been 'employed at' ten different locations, although three of these did not have this information recorded (Tables 1 and 2). There does not seem to be any pattern of some diggings having more cases than others; the Manuherikia, Kawarau, and Campbells Gully all have three patients, while the rest have either only a single case or two cases. The discovery of rich gold deposits in the Clutha River by Hartley and Reilly in 1862 marked the beginning of the Dunstan Rush and fanned out from this point (Pyke 1887). Manuherikia likely represents present day Alexandra but may also have been anywhere within the Manuherikia valley, where a rush began in April 1864 (Pyke 1887). The patients from Hogburn (Naseby), Campbells Gully, Serpentine and Hamiltons were all probably part of the Mt Ida Rush which began in late May of 1864. Two patients were working at the greatest distance from the hospital; Charles Brown and Hugh Riley, from the Nevis, some 20

kilometres from the Dunstan Hospital as the crow flies, but with the treacherous Old Man Range in between.

While these numbers are small, they likely represent men who were caught up in the mayhem associated with rushes to new diggings. Vincent Pyke who chronicled the early discoveries of gold in Otago noted that by 1864 'The feverish excitement of 1861 and 1862 has gradually died away … .' (pp. 91). 'The number of miners in Otago attained its greatest height at the beginning of 1864. By the census returns of December in that year the total population of the Goldfields was enumerated at 15,700 persons; … ' (pp. 91). Prior to this, in late 1862 and the beginning of 1863, the Wakatipu rush up the Arrow and Shotover Rivers was the largest and pushed into the most remote and dangerous parts of the region, all in a time when there were no established medical facilities and only sporadic supply of any food. The high numbers of scurvy noted as outpatients in the 1863 DHPR record are probably men who had been caught up in this Wakatipu rush. Similarly, the patients treated in early 1864 working in the regions associated with the Dunstan and Mt Ida rushes, were likely amongst the first miners to venture into these new areas, again before supply chains had been established.

Other people admitted to the Dunstan hospital during this time may have had healed scurvy that lacked acute clinical signs of the disease such as the characteristic purpura. For example, some of the 33 non-scorbutic rheumatic cases in 1864 may have been related to past scurvy episodes. This possibility is supported by Lind's description of the residual symptoms of scurvy where he explains that after recovery a scurvy patient is often left with swelling and oedema in their legs 'Such persons are likewise subject, in different periods of their life afterwards, to chronic rheumatisms, pains and stiffness in their joints: and sometimes cutaneous eruptions, or a foulness of the skin' (Lind 1753, p. 179). Therefore, while the acute effects of scurvy appear to have eased early in the gold rush days, the legacy of poor diet and privation may have continued for many years after. However, it should be noted that the nineteenth century doctor used the term rheumatism to describe a suite of joint pain from the arthritic to the infectious (Block 1999) and trying to navigate this diagnostic rabbit-hole has beaten even the most experienced of medical historians (Fox 1932; Storey et al. 1994).

The Dunedin Hospital Casebook (DHCB)

The Dunedin Hospital Casebook (Vol II) is another source of health information from the early period of the city. While the DHPR simply states the disease a patient was suffering, the casebook describes the patient's history, their physical symptoms, the treatment, and status of recovery. There were 17 cases of scurvy in the DHCB during the period between 1864 and 1869. All were men and 14 of these were seamen recently arrived in the city from on board a ship. The land-based cases were from 1864-1865, and the later cases were all from ships, demonstrating a provenance of scurvy cases unrelated to our market gardening question (Table 3).

Three ships had more than one man suffering from scurvy on arrival to Dunedin. On the 'Echunga' (arrival October 1867) three men were admitted within a couple of days of each other. James Ratcliff was an immigrant just landed from the 'Echunga'. He was a 41-year-old native of Derbyshire and admitted for 'pupura haemorrhagia on legs, gums swelled, general debility' (Archives New Zealand. DHCB. 1867, p. 480). He was treated with citric acid, potassium bicarbonate and Milk and Beeftea. He left after about a

Table 3. Biographical details of patients admitted to the Dunedin Hospital for Scurvy 1863-1869.

Date	Name	Age	Native of	Employment	Ship	Disease	Result	Discharged	DHCB page number
04/01/64	Lawrence Crosteel	28	Sweden	Seaman	Lansdown	Scurvy	Cured	16th Jan '64	10
30/11/64	John Stewart	23	New York	Ship's steward	Otago from Wellington	Rheumatic w-scurvy	Cured	30th Jan '65	59
16/01/65	Benjamin Humpage	30	Bristol, lately Waipori	Surgeon	n/a	Scurvy and scabies	Cured	21st Feb '65	66
28/02/65	Thomas Scott	21	Roxburgh	Miner (Serpentine)	n/a	Fever and purpura (scurvy)	Cured	15th May '65	89
21/11/65	Robert Harris	47	Whitechapel	Ship's cook	Fawn	Scurvy? Tubercular elephantiasis	Passage to Europe – not cured	March 1868	212
06/10/66	Alexander Morrison	25	Argyle	Seaman	Rowena	Scurvy	Cured	2nd Nov '66	343
06/10/66	Charles Anderson	27	London	Seaman	Rowena	Scurvy	Cured	5th Nov '66	343
26/11/66	H.L. Hermannson	32	Sweden	Seaman	Wilhelm Gynther from Sweden	Scurvy (in a severe degree)	Cured	13th Feb '67	355
10/01/67	Andrew Lawson	40	Sweden	Not stated	Celeano from London	Scurvy	Cured	14th Feb '67	369
16/01/67	Thomas O'Connor	44	Dublin	Seaman	Celeano from London	Scurvy	Cured- told to leave for disorderly conduct	24th April '67	372
27/02/67	Louis Hansen	24	Norway	Seaman	Countess of Russell from London	'incipient' scurvy	Cured	18th March '67	388
16/10/67	Henry Williams	33	St John's Newfoundland	Seaman	Echunga	Scurvy	Cured	18th Feb '68	421
06/07/67	Charles Jeremiah (Meyer)	About 30	Friendly Islands (of Polynesian race)	Seaman	Beautiful Star from London	Scurvy	Cured	20th Aug '67	439
15/07/67	Hendrew Helstrome	26	Sweden	Seaman	Westra	Scurvy	Cured	26th Aug '67	442
15/10/67	James Ratcliff	41	Derbyshire	Immigrant (just arrived)	Echunga	Scurvy	Convalescent	9th Nov '67	480
16/10/67	Joseph Kantze	34	Prussia	Seaman	Echunga from London	Scurvy	Cured	26th Nov '67	481
19/06/69	John Wilson	26	Holland	Seaman	Merriton	Icthyosis of feet (history of scurvy)	Not stated	Returned to ship 28th June '69	703

DHCB = Dunedin Hospital Casebook.

month as a convalescent. Another man (Joseph Kantze) from the 'Echunga', this time a seaman, a 34-year-old native of Prussia (Archives New Zealand. DHCB. 1867, p. 481), was admitted one day after James Ratcliffe on October the 16th. He was affected with 'scurvy in the lower extremities chiefly- gums little swelled- bluish stains in the popliteal spaces, yellow colour of thighs and legs, with dark patches on shins: the knees bent and stiff, could be straightened but with pain'. The blue and dark patches under the skin would be evidence of the haemorrhage associated with scurvy of the muscles and into the joints. He was treated with Milk and Beeftea, citric acid, potassium bicarbonate, Acque?, horis? 'Full diet afterward instead of beeftea'.

Symptoms of bluish stains of the shins and stiffness in the knees, as described above, were common amongst these scorbutic hospital patients. For example, in 1867 Charles Jeremiah (Meyer), a 'native of the Friendly Islands (of Polynesian race)' was admitted with scurvy (Archives New Zealand. DHCB. 1867, p. 439). He was a seaman ex the 'Beautiful Star' and had come to Dunedin from London. His symptoms were 'swelling of the gums, debility, stiffness of the knee joints, and discolouration with hardness in the popliteal spaces of both thighs'.

The other two ships with more than one scurvy sufferer on landing were the *Rowena* (October 1866) and the *Celeano* (January 1867). One of the men on board the *Celeano* was discharged as 'cured' after a month while the second man, a Thomas O'Connor was in for 4 months before he was 'told to leave the Hospital for disorderly conduct' (Archives New Zealand. DHCB. 1867, p. 372). Only one of these sailors is recorded as having left the hospital to return to their ship. The protracted stays for many of the other men presumably left them without employment and far from home. As the cause of scurvy, and the treatment, was known in this period the lack of duty of care of the shipping companies seems apparent in the regular occurrence of this readily preventable disease.

Of the non-seamen, Benjamin Humpage was a 30-year-old native of Bristol, living in Waipori (Archives New Zealand. DHCB. 1865, p. 66). He was a 'surgeon' and was admitted on the 16th of January 1864 for scabies and 'purpura (scurvy)'. The only miner in the group was Thomas Scott a 21-year-old man from Roxburgh (Scotland?) (Archives New Zealand. DHCB. 1865, p. 89). He had been working as a miner in Serpentine and was admitted in February 1865 with 'fever and purpura'. The scorbutic affection shewed itself in discolourations of the Skin on the arms and legs- of a dark red colour with effusion into the cellular tissue' (Figure 3).

Death registers

In the very early period of the Otago goldrushes death was frequent, and in many cases men disappeared without a trace. While legally all deaths were supposed to be registered, this did not always occur. Bodies and even the skeletonised remains of men were found who were never identified (Dwyer 2003). Death from accidents and drownings are most frequent causes in the Death Registers examined as part of a wider study underway. From the current evidence we will probably never know the full cost to life from the deprivations associated with the rushes up to 1864.

Permission to consult and transcribe the Death registers of the Otago region was granted to Buckley by the Registrar General in 2021. Only aggregated data can be disclosed, and the names of the deceased are not to be used, without permission of

Figure 3. Discoloration of the anterior part of the leg characteristic of the bleeding into muscles during a scorbutic attack. Source Wellcome Collection. No know copyright, Public Domain Mark.

family. In the Dunstan death register (1863-1875) there were 64 deaths of European men in 1863 and 1864. None of these were recorded as due to scurvy or for the rest of the registers where there was a total of 314 entries.

The Gabriel's Gully (GG) registers from 1863–1887 ($n = 700$ entries) were transcribed in full and due to time constraints, only the adult women and Chinese from 1888–1899 ($n = 155$) were transcribed. Two deaths caused by scurvy, prior to 1888, were reported. One was a Chinese man in 1867 who died of 'scorbutis' at the Tuapeka hospital (Archives New Zealand. GG 1871). The second is of a European man who died in 1875 from 'disease brought on by self-neglect (scurvy)' (Archives New Zealand. GG 1875).

For Manuherikia (1866-1875; $n = 61$ entries) and Cromwell (1868-1875; $n = 117$ entries) there were no scurvy deaths reported. Of course, some of the deaths in the earlier registers were of unknown men presumed drowned in rivers and others had died of 'exposure to cold'. These men, and others not registered, may have suffered from scurvy, hastening their deaths.

The absence of scurvy from the DHPR after the middle of 1864 and other land-based cases in the DHCB after 1865, negates the assumption that scurvy was 'rife' in the goldfields beyond the initial rushes and while there are few other extant hospital patient records, the death registers are almost completely devoid of scurvy-related deaths. The evidence from these sources therefore suggests that scurvy was *initially* a major problem in the gold fields, but the assumed lack of supplies containing Vitamin C into the frontier towns and gold fields does not appear to have persisted beyond 1864.

A newspaper account from February 1865 further attests to the easing of the scurvy burden through the establishment of vegetable gardens at the Dunstan District Hospital. The account begins with a description of the grounds and the gardens

> It stands within an enclosure of some eight or ten acres, part of which is under cultivation; and I believe the intention of the committee to have the whole planted out next season; which besides being an ornament, will effect a considerable saving of expense, as most of the vegetables used in the institution instead of being purchased will be grown on the spot

The reporter then describes the situation facing the surgeon only two years previously:

> Surgeon Dr Jackson had the most arduous duty to perform; there was scarcely any sleeping accommodation, but few beds or bedclothes, and a very poor stock of drugs, besides vegetables, so necessary for the relief of scorbutic patients, were unobtainable- this class of patients were then, owing to poor living very numerous, numbers being brought in every day in an almost dying state, while cases of frost bite from the ranges were of frequent occurrence. Now these classes of diseases are but of rare occurrence, owing to vegetables being of so readily obtainable, as well as improved manner of living among the miners. (Otago Daily Times, 16 February 1865, p. 6).

This account supports the DHPR evidence of the scurvy 'epidemic' being short and sharp, at least in this region of the Otago goldfields, and coincides with the end of the initial 'rush' into the new fields of Mt Ida and Manuherikia mid-1864.

Another source of information regarding the easing of the scurvy burden can be found in the report for Government of the Wakatip District Hospital covering the period Nov 30th 1863–29th Feb 1864. 'The nature of diseases are varied. At first all patients suffered principally from disease under head of 'scorbutic' (the most in number being disease and complaints connected with the chest)'. A table of all diseases compiled by the resident surgeon Dr Pelley is referred to, but not present. In April 1864 Dr Pelley states 'That the diseases are now generally of an acute character' (Lake Wakatip Mail, 2 April 1864, p. 6).

In 1871, The Evening Star made mention of a small rush to The Lammerlaw Range (50kms west of Dunedin), where the correspondent states these diggings are the most 'scorbutic' in the country (Evening Star, 4 February 1871, p. 2), but no further reports can be found on this.

Scurvy and Chinese gardeners

In 1865 Otago provincial authorities invited Chinese miners to the goldfields to help keep the money from the gold industry flowing. But it was not until 1866 that Chinese came to Otago in any numbers, initially from the Australian goldfields in the state of Victoria and then later, in the 1870s, directly from China (Beattie 2015). Beattie (2017) suggests that the fresh produce provided by Chinese gardeners would have helped to stave off disease from poor diets, such as scurvy. Dr James Ng, a clinician and Chinese historian, refers to a glut of vegetable produce in some parts of Dunstan goldfields district the 1870s 'that had arisen because of the need to counteract scurvy in the earlier goldrush years' (Ng 1993, p. 134). He also notes the last Chinese miner to die from scurvy was Ah Sing in 1872 at Macraes Flat (Ng 1993, note 50).

The Chinese were known for their affinity with gardening and even the most modest of Chinese miner's dwellings were usually associated with a small garden, producing

green vegetables (Ritchie 1986; Beattie 2017). The planting of fruit trees in house gardens and small orchards of plum and peaches were also established on arrival. Archaeological evidence of peach kernels has been found throughout the region (Ritchie 1986). The legacy of the planting of fruit trees and other edibles is seen in the clusters of old plums and tangled gooseberry bushes where hut sites once stood (Ritchie 1986).

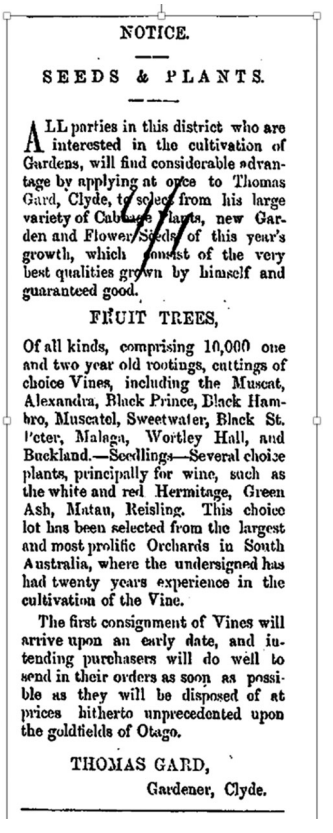
So-called 'market gardeners' started early as a small number of the first Chinese immigrants struck up this trade immediately on arrival in 1867 (Ng 1993). Initially, the industry of Chinese in their mining and setting up house gardens was greatly admired in both the Australian and New Zealand goldfields (Boileau 2017). Later, large scale market gardening in New Zealand was predominantly carried out by the Chinese and the frontier towns associated with the goldfields were grateful for the supply of fresh produce. Presumably, Europeans also quickly recognised the need to produce their own fresh vegetables and establish more permanent dwellings, with a house garden (Smith 1987). This strategy was quickly adopted by Australian Victorian diggers and regulations encouraged small land plots associated with gold claims, specifically to produce food (Boileau 2017). The initial influx of European miners to the Otago rushes were largely from Victoria (Belich 1996, p. 346), therefore it is reasonable to assume that both groups of immigrants came with the knowledge of a need to supplement their diet by growing fresh produce. In fact, formal provision had also been made for holders of Miner's Rights in Otago goldfields to be able to occupy ground for cultivation of food as early as 1862, four years before the Chinese arrived (Otago Provincial Council Votes & Proceedings, Session XVI 1862, p. 24).

Indeed, three of the patients in the early DHPR records (pre-1867) have their occupation recorded as 'Gardener'. One of these was Thomas Gard who was first admitted in 1866. He was admitted again in 1871 by which time he was advertising seeds and plants for sale in the Dunstan Times (Dunstan Times, 14 April 1871, p. 3) (Figure 4). Therefore, we would argue that in the early periods of the Otago goldfields, European miners understood the need to supplement their limited diet to keep scurvy at bay. However, it was not until supply chains opened after the initial rushes that they would have had the opportunity to grow fresh produce.

It must also be remembered that European settlement in the region had been underway for at least 20 years prior to the gold rush, including establishing home gardens. For example, gardening for both enjoyment and sustenance, was viewed as an important duty of any settler's wife (Soper 1948). Indeed, seed for garden vegetables and flowers were imported from 'home' and advertisements by 'Peter Lawson and Son' for Seeds and Plants are found as early as 1864 in the Otago papers (Otago Daily Times, 1 February 1864, p. 1) and was quickly followed by suppliers closer to home in New Zealand (Southland Times, 26 July 1864, p. 4). In a search of Papers Past advertisements in Otago Newspapers for 'Seeds and Plants' 1850–1870 there are fully 327 hits beginning in 1864.

This argument that Europeans may have been responsible for curtailing scurvy prior to the arrival of Chinese is not proposed to diminish in any way the contributions made to the Otago economy and society by the Chinese immigrants, but to explore some of the reasons as to why this 'assumption' has been maintained in the modern consciousness.

From the primary medical evidence assessed in this paper, by the time the Chinese arrived in 1867, there seems to be little evidence of this disease amongst the European miners of Otago. However, one of only two deaths related to scurvy in these records,



NOTICE.

SEEDS & PLANTS.

ALL parties in this district who are interested in the cultivation of Gardens, will find considerable advantage by applying at once to Thomas Gard, Clyde, to select from his large variety of Cabbage Plants, new Garden and Flower Seeds of this year's growth, which consist of the very best qualities grown by himself and guaranteed good.

FRUIT TREES,

Of all kinds, comprising 10,000 one and two year old rootings, cuttings of choice Vines, including the Muscat, Alexandra, Black Prince, Black Hambro, Muscatel, Sweetwater, Black St. Peter, Malaga, Wortley Hall, and Buckland.—Seedlings—Several choice plants, principally for wine, such as the white and red Hermitage, Green Ash, Matau, Reisling. This choice lot has been selected from the largest and most prolific Orchards in South Australia, where the undersigned has had twenty years experience in the cultivation of the Vine.

The first consignment of Vines will arrive upon an early date, and intending purchasers will do well to send in their orders as soon as possible as they will be disposed of at prices hitherto unprecedented upon the goldfields of Otago.

THOMAS GARD,
Gardener, Clyde.

Figure 4. Notice of Thomas Gard, a gardener from Clyde, advertising seeds and plants available for sale. Source Dunstan Times 14th April 1871.

in the goldfield towns post-1864 is of a Chinese man in 1867 died of 'scorbutis' at the Tuapeka hospital. Given the timing of this death in relation to Chinese immigration to the goldfields, it is possible he was among some of the first Chinese to arrive in the region. Also, given the relationship between scurvy and seafaring described above, it is possible his scurvy developed on the voyage to New Zealand.

Support for this interpretation can be found amongst the newspapers of the day. A rather disturbing account of Chinese experiences during the journey to New Zealand is given in 1868 in the West Coast Times (via Argus Melbourne) (West Coast Times, 1 October 1868, p. 3). The barque *Dayspring* arrived in Argus Melbourne from Hong Kong where all but 20–30 of the original 96 Chinese passengers had died of scurvy. The ship came via Williamstown, where an inquest was conducted. Evidence heard at the inquest tells of provisions that 'were inferior to those served to the ship's crew- in fact they were not only of inferior quality, but seriously curtailed of in quantity' (West Coast Times, 16 September 1868, p. 2). As the voyage around Australian ports progressed, the Chinese continued to die, and their bodies were thrown overboard, an horrendous outcome for these sojourners.

Other accounts of scurvy amongst Chinese sea passengers can be found; in September 1871

> The screw steamer Taranaki has arrived at Dunedin, bringing the San Fransisco mails ex Nebraska, and also two hundred and fifty Chinese ex the Joshua Bates. A recent telegram from the North stated that the latter vessel had put in at Auckland in a leaky condition, and her living freight afflicted with scurvy. Two died in the harbor, and three before arrival. The rest were placed on Motuiti Island for a few days, previous to proceeding to Dunedin, whither the majority of them have now arrived per mail steamer. (Dunstan Times, 22 September 1871, p. 2)

What follows is truly repulsive language that not only demonstrates a lack of understanding of the non-infectious cause of scurvy but also the ignorance of many of the European settlers of the day. In relaying the similarities in this occurrence of sickness coming from the sea the writer states;

> Common duty to the public, the instinct of self-protection, the dictates of humanity- all insist that these sickly Chinese, uninvited and unwelcome, shall receive care and attention. If they were a cargo of brute beasts less could not be accorded them. It may be argued that scurvy is not contagious; that a few days' run on terra firma and a return to vegetable diet will reduce the evil; but the doubt prevails that what is mildly termed scurvy may be something more malignant. The spectacle of a sick Chinaman creates, in even unprejudiced minds, most uncomfortable ideas, and the contemplation of the actual fact that a whole cargo of lazars, coming direct from the pestilential shores of the East, are to be let loose in Otago is horribly suggestive. We may hope that strict pre-cautionary measures have ere this been adopted. One thing is very certain if former warnings are disregarded, and these uncanny strangers are permitted to wander at their own sweet will throughout the gold-fields, the smouldering ashes of discontent will be quickly stirred into a blaze, and the Anti-Chinese agitation, just now in some measure subsiding, will be renewed with ten-fold vigor. (Evening Star, 18 March 1871, p. 2)

It is telling that the 'scurvy' did not afflict the European passengers and the account from the *Dayspring* indicates the Chinese were treated deplorably on some of these voyages. Scurvy became a disease of self-neglect among the Europeans, but a reflection of inherent evil and vice for the Chinese. In another account, later in September 1871 for some reason it needed to be qualified whether a Chinese man was suffering from scurvy; 'A report that obtained currency, to the effect that a Chinaman is suffering from scurvy at Bristol House, is, we are informed, incorrect. A Chinaman, one of the late arrivals, is suffering in the Hospital from weakness' (Otago Witness, 30 September 1871, p. 14).

The controversy surrounding the response to sickness on board the barque *Guiding Star* that arrived in Dunedin in early October 1871 is another example of mistrust and poor treatment of Chinese. (Lake Wakatip Mail, 4 October 1871, p. 2). Nearly 30 deaths occurred on the voyage due to 'scurvy and dysentery' (the diseases varied depending on the report) and the ship was quarantined on arrival. It took several days and several more Chinese deaths before the health officer declared there was no infection on board and allowed their release, yet more deaths occurred amongst the Chinese in hospital. There was general disquiet among the populace about allowing the Chinese to land in the city, and four more died once they were admitted to hospital (Cromwell Argus, 10 October 1871, p. 5).

Conclusions

Here we have interrogated primary medical archival sources to explore the validity of a long-held assumption that scurvy was 'rife' in the gold fields. This assumption has carried

through into the common vernacular and is used to describe the experiences of gold miners and further seeped into historiographic accounts. Evidence from archival sources show that while scurvy was highly prevalent in the earliest part of the gold rushes of Central Otago in 1863-1864, it did not persist beyond the initial push into new frontiers, at least in this region. The Dunedin Hospital Medical Casebook holds accounts of scurvy sufferers beyond this period, but they were overwhelmingly represented by seamen working on ocean going vessels and therefore unrelated to our question regarding Chinese market gardening. Newspaper accounts also show that Chinese were vulnerable to the development of scurvy on the voyage to the gold fields of Aotearoa and this was likely one example of the effects of prejudice suffered by these sojourners.

We have argued that while the enterprising Chinese market gardeners undoubtedly contributed to a more nutritious and varied diet for European miners and settlers, scurvy had already markedly reduced in frequency by the time of their arrival. We have shown that there were opportunities for procuring seeds and plants for home gardens and that provision was made for land with which to grow these as early as 1862 in Otago.

While this paper has dealt only with scurvy in adults, it should be noted that it is highly likely the disease persisted in infants and children for decades more. Scurvy was not recognised as a disease distinct from rickets in infants until the late nineteenth century and even then, weaning foods were largely inadequate in vital nutrients, during this vulnerable period of life (Lomax 1986). The association of very high infant mortality with infection and poor nutritive weaning foods of Victorian Otago will be addressed in a forthcoming paper. Another fruitful avenue of future research would be to compare the Otago experiences with other gold rush centres within New Zealand and beyond to Australia and the Americas but is beyond the scope of this paper.

Notwithstanding the argument that scurvy was not as much of a health concern among adults in Otago as previously thought, the cost to those who suffered from the disease in pain and suffering was immense. During the period in which scurvy was in fact 'rife' was also when there was little or no medical care available and relates to the Bioarchaeology of Care approach we have woven throughout this paper. That men died in their droves, some from scurvy or acute diseases exacerbated by the lack of proper nutrients is indisputable. From delving into the accounts of Lind (1753) the legacy of a 'long want' when rheumatic pain can persist after the scurvy is cured is also demonstrated. For those who were treated as out-patients the burden on family (if any were present) and the wider community, in a situation not dissimilar to modern-day refugee camps, would have had psycho-social consequences that are immeasurable today. The individual stories of previously anonymous patients found locked in these archival sources have demonstrated the importance of re-humanising the past to understand the biological and social context of these frontier times.

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