

Snow on cholera - The Special Lecture in the Second British Epidemiology and Public Health Course at Kansai Systems Laboratory on 24 August 1996 -

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The Second British Epidemiology and Public Health Course was held from 19 to 25 August 1996 in Osaka as a satellite meeting for the 14th International Scientific Meeting of the International Epidemiological Association. Thirty-three researchers from 10 countries participated in the course. Professor Walter W Holland gave a special lecture about Snow on cholera during the course, and the lecture revealed that Henry Whitehead who was a junior priest at that time contributed to Snow's work to prevent the cholera outbreak in Golden Square in 1854. What John Snow did in his life are reviewed in detail in this paper. *J Epidemiol*, 1998 ; 8 : 185-194.

John Snow, cholera, Henry Whitehead, British Course

After the success of the First British Epidemiology and Public Health Course in 1994 ¹⁾, the second course was planned. The organising committee for the course (see Table 1) was able to prepare it from 19 August to 25 August 1996 in Osaka, just before the 14th International Scientific Meeting for the International Epidemiological Society ²⁾. Thirty-three researchers from 10 countries (including 20 from Japan) participated in and discussed in the course.

Table 2 summarises the programme for the course. The special lecture by Professor Walter W Holland was highly appreciated by both participants and lecturers. It was a high light of the course. We therefore dictated the recorded tape to enable readers to share our experience, on behalf of the course organising committee.

A BIOGRAPHY PUBLISHED IN 1995

Professor Hashimoto:

Professor Holland now gives the lecture about Snow on cholera. It was considered as very impressive in the first course. Concerning Snow on cholera, I always give a lecture

as my first lecture to my students. I think almost all the Japanese professors of epidemiology or public health would like to speak about John Snow in their lectures. I regret that in the first course, I missed his lecture. But today, I can listen to the lecture from first to last. I think it will be checked whether my lecture was correct or not.

Professor Holland, please begin your lecture.

Professor Holland:

Thank you very much indeed, Professor Hashimoto. I think I have a very great problem that the last time I gave this lecture, it was completely unrehearsed, and I wasn't told to give the lecture until the last minute so I wasn't quite certain what I was talking about. But on this occasion, I was warned that I would have to give it. So I have had to look out certain things about it. Maybe you are lucky to have avoided the first lecture because probably I got it all wrong.

I have a very big problem in preparing this talk about Snow. Although I am trying to write a history of the development of public health in the United Kingdom, I start it in 1918, rather than 1813 which is the year when Snow was born. So I have

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Table 1. Organising committee for the Second British Epidemiology and Public Health Course.

	personnel	affiliation*
Consultants	Itsuzo Shigematsu Kunio Aoki Hiroshi Yanagawa	Radiation Effect Research Foundation , Japan Aichi Cancer Center, Japan Department of Public Health, Jichi Medical School, Japan
Co-chairman	Walter W Holland Tsutomu Hashimoto	LSE Health, London School of Economics and Political Science, UK Department of Public Health, Wakayama Medical College, Japan
Special guest	Richard Doll	Clinical Trial Service Unit and Epidemiological Studies Unit, University of Oxford, UK
Lecturers	J Michael O'Brien Anthony J Hedley Kazunori Kodama Hirosugu Ueshima Yosikazu Nakamura Kiyomi Sakata	Northumberland Health Authority, UK Department of Community Medicine, University of Hong Kong, UK Department of Clinical Studies, Radiation Effect Research Foundation, Japan Department of Health Science, Shiga University of Medical Science, Japan Department of Public Health, Jichi Medical School, Japan Department of Public Health, Wakayama Medical College, Japan
Secretaries	Noriko Yoshimura Seiji Morioka	ibid. ibid.

* : As of August 1996.

Table 2. Programme for the Second British Epidemiology and Public Health Course

date	contents (lecturers)
19 August 1996	Public health in Japan (Dr Sakata) NHS and functions of public health in UK (Dr O'Brien)
20 August	Linking epidemiology to health planning (Professor Holland) Presentations by participants
21 August	Information and record linkage (Professor Hedley) Evaluation of care / outcome (Professor Hedley) Presentations by participants
22 August	Investigation, control and surveillance (Dr O'Brien) Levels of health (Dr O'Brien) Cohort study on the Atomic-Bomb survivors (Dr Kodama) Alcohol consumption and blood pressure (Professor Ueshima) Epidemiology of Kawasaki Disease (Dr Nakamura)
23 August	Case-control studies on intractable diseases (Professor Yanagawa) Epidemiology of hip fracture (Professor Hashimoto) Presentations by participants Impact of smoking on health (Sir Doll)
24 August	Screening and evaluation of new services (Professor Holland) Linking epidemiology to economics (Professor Hedley) Presentations by participants Snow on cholera (Professor Holland)

had to read all of the biographies very rapidly.

Fortunately, just before I came to Japan, I discovered that a book has been published⁹ called "John Snow - anaesthetist to a Queen, epidemiologist to a Nation", actually written by an anaesthesiologist in Canada, who graduated from St Thomas's. So, at least it comes from the right place. Reading about John Snow, actually gives you quite a good idea of the development of medicine and related things in England in the 19th century. It is very interesting.

SNOW, HIS BIRTH AND EDUCATION

John Snow was born in 1813, and he died in 1858. He was born in York, and he had 9 brothers and sisters. His father, at the time of his birth, was a carter, that is a man who transported things in a wagon. Soon after Snow's birth, he took to farming locally. The interesting thing about it is that John Snow attended a private school, and not a public school, not a state school, even though obviously his family was quite poor. And so it would be very interesting how his family could afford to send him to the private school. His mother's family came from Bath, and it was partly her money, which paid for John's education.

At school, he worked extremely hard, and he took school very very seriously. However, he left school at the early age of 14. And then, having had a very sound education, he decided that he wanted to do medicine.

HOW TO BECOME A DOCTOR IN UK IN 19TH CENTURY

There were three possible ways to become qualified to do medicine at that time. The first way was to become an apothecary or apprentice to an apothecary; that is one went to work with an apothecary and helped him until the exams. No other schooling was required. The second way, at the beginning of the 19th century, was to go to medical school. There were several medical schools, many of which no longer exist, and to obtain a qualification called the MRCS, membership in the Royal College of Surgeons. Both education generally and medical education, changed during Snow's life time. Medical schools became accredited and the creation of the General Medical Council controlled the quality and standard of the education of doctors. The third way was to practice as an apprentice with a physician and become a licentiate of the Royal College of Physicians. These three alternatives were of different orders of difficulty, apothecary was the easiest, medical school was next, and finally the Royal College of Physicians licentiate ship.

John Snow was quite unusual in that he did all three. He completed all three types of training, apothecary, medical school, and the Royal College of Physicians. After finishing

school in 1827, Snow became an apprentice to Dr Hardcastle in a little town in northeast England, Newcastle. Hardcastle apparently was quite a noted practitioner, and very highly respected as a general practitioner and a surgeon.

SNOW ON CHOLERA IN NEWCASTLE

Within four years of starting work with Hardcastle, there was an epidemic of cholera in Newcastle, between 1831 and 1832. This cholera was brought there by a ship which had docked in another place nearby, called Sunderland. In this epidemic of cholera, 368 people became ill in and around Sunderland, and altogether 178 had died. In all of England and Wales as a result of that epidemic of cholera, there were 22,000 deaths.

Part of Hardcastle's practice, Snow was around a colliery, a deep mine called Killingworth. There were a large number of cases of cholera amongst the miners in this particular colliery. Snow thought that the reason that there were so many cases amongst the miners was because of the lack of privies underground. Privies are what we now call lavatories.

I can tell you a similar story of my own experience when I was in the Air Force just after the War. The Royal Air Force station for which I was responsible had just built a new atomic bomb proof underground shelter for long distance radar. It was an extremely expensive shelter. If there was an atomic bomb strike, the people who worked there would stay underground for many days. I was a very new medical officer, and I was asked by the commanding officer, to inspect this new facility to certify that it could be used. I sensed there was some problem. So I inspected but couldn't see anything wrong. So I went round a second time, then, at last, I realised that there was something very wrong. That facility cost somewhere around 20 million pounds to build, today's price would be about 200 million pounds. I asked the builder and architect, "Excuse me, but where do the personnel, and there would be several hundreds of them, go to the lavatory when they are on duty?" And the architect said, "Oh doctor, I forgot! There are no lavatories underground." This meant that it could not be used! So these mistakes occur even now, as they did at the time of John Snow.

Snow continued to his work with Hardcastle until 1836. He then decided to take an examination. He took the apothecaries' examination in 1836 and passed. To give you an idea what he had to do, he had to know Chemistry, Anatomy, Physiology, Materia Medica, and a lot about the Principles and Practical Application of Medicines, he had to know Dissection, Botany, Midwifery and Forensic Medicine, to further his education he had to attend recognised hospitals which he couldn't do with Hardcastle.

So he decided to go to London. He had been working for a long time, so he decided to go to London from Newcastle via

Bath, which is a long way around. In Bath he visited his mother's family. He decided to lodge in Soho while in London. Soho comes into the story quite a lot.

ACADEMIC PROGRESS OF SNOW IN LONDON

Dr Mori very kindly lent me this photograph. That house is in Soho and he, John Snow lived in Soho and went to what was known at that time as the Hunterian School of Medicine. Even though he was a student at this time, he started to do research on the toxicity of arsenic. The hospital he went to was a place called Westminster Hospital which doesn't exist any more but which at that time was one of the most modern hospitals in London.

Snow got his licentiate from the Society of Apothecaries, LSA in 1838 and became a general practitioner in Soho in a street called Frith Street. He was well known as a very good general practitioner. It is important for you to realise that he never married, remained single all his life and was a very honest and hard working person. Because he was ambitious, he decided that the apothecaries' exams wasn't sufficient. So he decided to become a Bachelor of Medicine by going to another medical school. He passed that in 1843, and one year later, he passed the MD, i.e. Doctor of Medicine in 1844.

Now the MD until 1952, was an examination which could be taken in England in the same way that it can be taken in the United States and most other countries. Since 1952 in England, the MD is a higher degree, one has to write a dissertation and which is different from what it was in Snow's time.

His work at that time, a part from general practice, was on the effect of lack of oxygen and the excess of CO₂, i.e. physiology. Snow called himself a physiologist. In 1846, his life took on a completely new direction. Until 1846, he was a general practitioner, who had particular skills and interests as an internist. He was very well trained and he had academic interests.

SNOW AS AN ANAESTHETIST, AND AS A PHYSIOLOGIST

In 1846, he was present at the first time that an anaesthetic was used when a dentist took out a tooth in England. He realised this was something extremely important. He was always concerned with social factors in the causation of diseases.

To give you some idea of his life, I will give you a history what happened between 1847 and 1858 when he died. In 1847, he started to give anaesthetics, and wrote several key papers on the effect of ether on consciousness, and wrote a key monograph on the subject. In 1848, he began to work on chloroform and other volatile agents and published several research

papers between 1848 and 1851 on the effects of volatile agents on consciousness. I cannot emphasise how prolific his output was. Certainly, I cannot imagine writing so many papers in 11 years.

In 1848, at the same time as doing work as an anaesthetist, he investigated an outbreak of cholera and wrote the first key paper on cholera and also a book which on typhoid and cholera. In 1850, he was consulted by Queen Victoria on the birth of Prince Arthur, and at the same time, he became a licentiate of the Royal College of Physicians of London, which I mentioned earlier. He was also elected a founder member of the Epidemiological Society of London.

In 1851, he wrote to Lord Campbell on chloroform in the Prevention of Offences Bill and wrote about mental control about analgesic agents. In 1852, he was orator of the Medical Society of London. In 1853, he anaesthetised Queen Victoria, and moved to Sackville Street. In 1854 he was vice president of Medical Society of London, and investigated the cholera outbreak, and he became the president of the Physiological Society. In 1855, he published the second edition of his work on cholera, and was elected the president of the Medical Society and gave evidence to Parliament regarding the Public Health and Nuisances Removal Bill. In 1857, he anaesthetised Queen Victoria on the birth of her child, and was elected president of the Epidemiological Society. In 1858, he wrote on chloroform, and died on June 16 of that year of a stroke. So over that very short period of 11 years, he did an enormous amount of work.

Before going on to his well-known work on cholera, I think it is important to realise that he was the most influential anaesthetist at that time in London. Certainly he was considered to be a most knowledgeable individual. To give you an idea what he contributed to anaesthesia: - he defined some of the pharmacological characteristics of a group of volatile agents and showed an inverse relationship between the solubility in the blood and their potency as an anaesthetic agent; secondly he established the relationship of these agents between blood concentration and the depth of anaesthesia; thirdly, he showed that in the administration of anaesthetics, that the volatility of the agents depended on the ambient temperature; he stressed the consequent need for efficient vaporisation of these agents and developed the instruments for the delivery of anaesthesia; he showed the importance of dead space in anaesthetics, and he showed how important it was to eliminate carbon dioxide while giving anaesthetics. Finally, he identified some of the physiological effects of some of the drugs used in anaesthetics.

The only thing he got wrong, in anaesthesia, was his denial that chloroform could cause some deaths, which is interesting, since we all know that one of the problems in chloroform is sudden death, but he denied this.

SNOW ON CHOLERA

His work in internal medicine, generally took over much of the other work. He worked in the Brompton Hospital, which is still one of the major chest hospitals in London.

His work on cholera can be divided into two parts. His work developed from the stimulus of experience in Newcastle. It can be divided into two periods, 1848 - 1853 and 1854 - 1858.

Cholera had been well known in England, Germany, and various countries, since outbreaks had occurred particularly in India in 400 AD. It was only recognised in England after 1817, and only reached Europe in the 1820's. It killed hundreds of thousands of people in the 19th century. People knew about the needs to rehydrate already at the beginning of the 19th century. The idea of giving fluid intravenously was already quite common in Europe at that time.

The reason why Snow became so famous was the argument about the causation of cholera. This was a general problem of this really common problem in infectious diseases. There were two theories. One of school of thought was that cholera was contagious. The second thought was that it was spread through miasma, that is the general environment caused the disease. The contagious school of thought traced its origin back to many centuries, particularly to the Old Testament. The other school held that diseases like cholera spread through the agencies of the atmosphere or environment. The contagiousness, also traced its ideas back to classical Hippocratic features. There were thus two completely opposed schools of thought. Snow forced people to think very carefully about polluted water which caused the disease.

CHOLERA EPIDEMIC IN 1848-1849

The 1848 to 1849 epidemic was the first one that Snow really became interested in. The 1848 epidemic was probably one of the most severe epidemics. There were around 54,000 people who died of cholera in England and Wales, and 14,000 diseased people in London, in particular where Snow lived.

Cholera in the 1848 epidemic arrived on a ship which docked in London on 22 September from Hamburg. A seaman carried the disease, and he spread it. Snow's significant contribution was his recognition of the path of infection. A man named Blenkinsopp became ill with cholera 8 days after the death of John Harnold from Hamburg. He lodged and slept in the same room. The doctor Russell who treated these two men, reported some subsequent cases in Horseleydown, which commenced three or four days later, and broke out "a little way removed from that of the two proceeding." This intrigued Snow, although there was no apparent connection between the cases, closer study did reveal a connection, namely "an open sewer, up which the tide flows, runs past both places, and the sewage from the houses in the first neighbourhood is, when the

tide rises, carried past those in the second." So that is how Snow really thought that cholera was spread at that time.

Snow knew from his Killingworth days, that cholera could be transmitted on physical objects, which were contaminated food, hands, and things like that. Therefore he did not deny the possibility of cholera spreading from man to man, but he thought the most important source of transmission was water, and felt that the sanitary measure most required is a supply of clean water from some source quite removed from the sewers. He also stressed the need "for all persons attending or waiting on the patient to wash their hands carefully, and frequently, never omitting to do so before touching food." I was most impressed by the cartoons in the lavatories of this floor which show what Snow suggested, in your outbreak by E Coli O-157.

The outbreak in 1848, which particularly interested Snow, was an outbreak in a children's institution, where there were many children, 180 of the 300 who contracted cholera died. It too was a very large outbreak.

The other point to remember was that at this time, there were a number of other epidemiologists working on this condition particularly a man called Budd. Budd came from Bristol and he was more famous for the investigation of typhoid. Budd almost got the same answer as Snow. He too, thought that it was due to transmission through water. But he thought it was transmitted by fungi, in fact he said that there were fungi in water which transmitted cholera.

Now perhaps I can read you the most important aspects that he noted. He investigated an outbreak in a place called Albion Terrace and Thomas Street, two parts of Soho. The number of houses was relatively small, but "there were plentiful of cases in a very small area." What impressed Snow about these two outbreaks was "the circumstances of the cholera evacuations into the water which caused the disease to spread so much beyond its ordinary extent." He was convinced it was spread by water and lack of hygiene. It did not show up in other parts of London.

Now as the result of investigating this outbreak, he investigated another in the summer of 1849. For this he used statistical records as well as looking at the subjects. The statistical data came from the Registrar General. This strengthened his hypothesis. The death rate from cholera was much higher in districts south of the Thames, that is those districts in which the water was supplied by a company getting it from the Thames, where it was much polluted by the sewers, rather than from the northern part of London, which did not use water from rivers / wells near sewers. That very much strengthened hypothesis.

The result of this work was published in his monograph on cholera in 1849. The publication of that monograph had very little effect. As a pamphlet, a vehicle often used in the 18th and 19th century to disseminate ideas, also did not result in any notice being taken.

The weakness was that the explanation was at best only a

probability rather than certainty as Snow admitted, - an interesting comment -, it still happen to all of us as epidemiologists. I can quote a particular crucial suggestion from the reviewer: - "The experimentum crucis would be, that the water conveyed to a distant locality, where cholera had been hitherto unknown, produced the disease, in all who used it, while those who did not use it escaped."

That is quite an important statement. Snow used that idea in the next outbreak he investigated five years later. In 1851 he read a paper to the Epidemiological Society where he reiterated his belief that cholera could be propagated by human intercourse. He particularly dismissed the miasmatic theory of the spread of cholera. Instead he emphasised the role of evacuation of infective materials from the bowels of infected people and spread through the water supply. He cited a series of case histories of people who had cholera who were in the bedrooms and touched by other ill people, as well as the water supply being contaminated. However he really didn't get any proof, until very much later, and in the outbreak in 1854.

THE GOLDEN SQUARE EPIDEMIC, 1854

The 1854 outbreak was quite a major outbreak, which occurred in the Broad Street area of London. I quote about this particular outbreak "that the cases were all around one particular water pump," the famous pump where the pump handle was removed.

The interesting thing was that there were several water pumps in this area, including one in Rupert Street, as well as one just outside the Pub "John Snow." Snow used the suggestion from the reviewer that people who lived near the Rupert Street pump who became ill did not use the Rupert Street pump but used the pump in Broad Street. There was in particular one old lady who had water transported from the Broad Street pump to where she lived in Hampstead, because she liked the taste of the Broad Street water rather more than the taste of water in Hampstead, and she became ill as did others who used the Broad Street pump.

That was really the crucial experiment. Now everybody always credits the removal of the pump handle as causing the end of the epidemic of cholera. In fact, that wasn't so. Snow did not remove the pump handle. He suggested it might be removed, but he noted the course of the epidemic was going down already before this suggestion. He thought the epidemic was over nonetheless he thought that the water from that particular pump should not be used. He, in contrast to Budd, taught us that one did not need to identify an agent to know about the cause and prevention of disease.

DESCRIPTION OF WHITEHEAD

Now, the man whom I certainly did not mention last time,

who certainly deserves a great deal of credit is a curate who worked in Soho. He was Henry Whitehead, and deserves almost as much credit as Snow does, for the investigation and final proof of cholera induced by the water supply. This was clearly indicated in Snow's biography³⁾.

"Although the Broad Street outbreak is in general, familiar as an episode in the history of medicine and particularly of epidemiology, many of the details of the outbreak and of Snow's role in solving the problem are not. Much has been written on the Broad Street outbreak, but much that has been written about it is wrong. In particular, the myth has arisen that the epidemic ceased immediately after Snow, understanding the cause of the outbreak, simply removed the handle of a water pump in Broad Street. Here legend has usurped fact, for the statement of this sentence is untrue. Snow very soon realised that pollution of the well water was one of the causes of the outbreak, but he did not know how the well become polluted. This was ascertained not by Snow, but by the local curate Henry Whitehead. Snow himself did not remove the handle of the pump, though he was the one who recommended it, but he didn't remove it. Because the epidemic was on the wane before the handle was removed.

The outbreak began during the night of August 31 and September 1 in 1854. It originated in number 40 Broad Street. This house abutted, in front, onto the pump from which many of the people in the area and some people further away came to drink its water."

"At the end of August, a baby girl in this house became ill with diarrhoea, and on August 28, 29 and 30, her mother had emptied considerable quantities of water containing the diluted dejections of the infant into the adjoining cesspool. The baby died on September 2, of exhaustion after an attack of diarrhoea. Whether the infant truly had cholera cannot be proved, though her illness preceded the explosive outbreak of cholera in the Broad Street area by about 48 hours, and her death was recorded as being among the deaths from cholera. However, as examination later revealed, the basement of this family's house had an atmospheric connection with the street sewer, and the cesspool was so choked and defective that its filthy faecal contents percolated into the soft black soil around into the well itself. Pollution of the well was inevitable, and it is likely that the infant's illness and the mother's actions were all that was needed to initiate an outbreak of cholera that killed some 600 persons within a few days. The infant's illness, the mother's actions, and the manner in which the Broad Street pump was polluted were not known to Snow at the beginning of September in 1854. However, once it became obvious that cholera had struck his area, he wasted no time in finding out what was happening."

This was the observation of Whitehead, not of Snow.

DESCRIPTION OF SNOW ON CHOLERA

Then Snow's own writing on it ⁴.

"There were a few cases of cholera in the neighbourhood of Broad Street, Golden Square, in the latter part of August. And the so-called outbreak, between 31st of August and 1st of September, was as in all similar instances only a violent increase of the malady. As soon as I became acquainted with the situation and extent of this irruption of cholera, I suspected some contamination of the water of the much frequented street-pump in Broad Street, near the end of Cambridge Street. But on examining the water on the evening of 3rd September, I found so little impurity in it of an organic nature, that I hesitated to come to a conclusion. Further inquiry, however, showed me that there was no other circumstance or agent common to the circumscribed locality in which this sudden increase of cholera occurred, and not expanding beyond it, except the water of the above mentioned pump. I found, moreover, that the water varied during the next two days, in the amount of organic impurity, visible to the naked eye, on close inspection, in the form of small white flocculent particles; and I concluded that, at the commencement of the outbreak, it might possibly have been still more impure. I requested permission, therefore, to take a list, at the General Register Office, of the deaths from cholera, registered during the week from the end of August to 2nd September, in the subdistricts of Golden Square, Berwick Street, and St Ann's, Soho, which was kindly granted. Eighty-nine deaths from cholera were registered during the week in the three subdistricts. Of these, only six occurred in the first four days of epidemic; four on Thursday, 31st August; and the remaining 79 on Friday and Saturday. I considered therefore that the outbreak commenced on the first four days; and I made inquiry in detail, respecting the 83 deaths registered as having taken place during the last three days of the week.

On proceeding to the spot, I found that nearly all the deaths had taken place within a short distance of the pump. There were only ten deaths in houses situated decidedly nearer to another street pump. In five of these cases, the families of the diseased persons informed me that they always sent to the pump in Broad Street, as they preferred the water to that of the pump which was nearer. In three other cases, the diseased were children who went to school near the pump in Broad Street. Two of them were known to drink the water; and the parents of the third think it probable that he did it so. The other two deaths beyond the districts which this pump supplies, represent only the amount of mortality from cholera that was occurring before the eruption took place.

With regard to the deaths occurring in the locality belonging to the pump, there were 61 instances in which I was informed that diseased persons used to drink the pump water from Broad Street, either constantly or occasionally. In six instances, I

could get no information, owing to the death or departure of everyone connected with the diseased persons; and in six cases, I was informed that the three diseased persons did not drink the pump water before their illness.

The results of the inquiry then was, that there had been no particular outbreak or increase of cholera, in this part of London, except among the persons who were in the habit of drinking the water of the above mentioned pump-well."

CONCLUSIONS OF SNOW

So that is the description which in fact is the basis for the conclusions from his report. You have in your hand-outs, the map that he drew where the houses were and then four or five years later, a Parliamentary Commission of which Snow was one of the members concluded about the importance of cholera. This was called the Cholera Inquiry Committee of the parish of St James, Westminster. Snow reported as a member and the leading scientific investigator. That emphasised the importance of water supply in the spread of cholera. But some of the findings were written by Whitehead and not by Snow.

There were - firstly the number of cases, secondly where they drank the water, thirdly the relation of individuals who drank the water from the Broad Street pump, fourthly the probabilities on the basis of the numbers, fifthly although there were two factories next door, they didn't get their water from the Broad Street pump and there were no cases in them, sixthly a contrast between the men found particular in the Brewery nearby who didn't get the water from the Broad Street pump, they didn't get cholera, while the other one which did get water from the Broad Street pump had cases. Finally, the importance was that those who were aged and infirm, when isolated, couldn't get their water from Broad Street pump didn't get cholera. And thus, it was important to have clean water supply.

As a result of that, there was a Parliamentary Committee which confirmed the need for clean water supply. That all happened just about the time that Snow died of stroke in 1858. At least he had some recognition for the importance of his work.

I'm sorry, but I've read some of the things straight from his chronicle which is summarized in this book, this biography of John Snow. I hope that gives you some more accurate account of John Snow than I gave you last time.

Now the time is up, and any questions?

QUESTIONS AND ANSWERS

Professor Hashimoto:

Any question, or any comment? Thank you very much for your excellent lecture. Do you have any question?

Professor Ueshima, did you give the lecture correctly? Dr

Matsuda, do you have any comment? You give much home tasks to the fellows.

Dr Matsuda:

This is the second time that I listened to the lecture from Professor Holland about John Snow's history. Sometimes, I am also in charge of the education of epidemiology to my students, and I refer to John Snow. I think John Snow's work is quite important to show how epidemiology is important. So I'd like to have the books which Professor Holland showed us, and I'd like to buy them and summarise, introduce them to my students. I would like to know the price of the books.

Professor Hashimoto:

It is my privilege that Professor Holland promised me to send a copy of this book for me.

Professor Holland:

That is the reference of this book. This is the best, as far as I have read about John Snow, very much more detailed in any of the other books including Snow's original biography. I have provided for you the exercise of which gives you the figures what I am talking about. I have repeated them to show you the map. As Dr Matsuda says, the interesting thing about this is that it illustrated extremely well how epidemiology is hard work and has difficulty in it all the time.

Only many years later, and yet the necessary measure to prevent future attacks of cholera before the identification of the agent. So, as with smoking cigarettes, we don't know which particular part of the cigarette causes cancer of the lung, but we know it does. Perhaps one of the most interesting things in the history of epidemiology is the conflict which existed between two different schools of thought amongst the epidemiologists at that time, the miasmatic theory and the theory of contagion. I don't think that is unusual even now, there are similar different thoughts on many other subjects.

The other important thing which perhaps I haven't talked well enough is the way in which Snow was able to use statistical data to boost his clinical appreciation. He got permission to collect the necessary statistical data because of friendship with William Farr. It illustrates well that you need some biological knowledge if you investigate a disease outbreak.

The final point is how eminent Snow really was outside of epidemiology. He is more eminent as an anaesthetist than as an epidemiologist. His contribution to anaesthesiology is probably greater than that to epidemiology, or at least as great as his contribution to epidemiology. Again, I know nobody either of John's generation, or my generation, capable of contributing to two subjects in the way that he did.

Participant A:

Thank you for your excellent lecture and explanation on

work and life of John Snow as an epidemiologist. If we look at the problem which he was challenged by, what will be your comment, especially the present pandemic? Or what was the lesson as an epidemiologist?

Professor Holland:

I think two major lessons. First we tend to forget the lessons from the past. We rediscover facts. The second is, it appears, epidemiologists were listened to very much more closely by those in the responsibility in 1840 and 1850 than now. I would suspect that if you are the chief epidemiologist, you would have a greater problem than John Snow did.

Snow obviously mobilised local opinion and perhaps the lesson is how local people can become concerned in the propagation of diseases. It is interesting that a local curate was used to control pandemic.

Professor Hedley:

Walter, does anybody know what curate is?

Professor Holland:

I'm sorry, you are quite right. Curate is a junior priest.

Participant B:

Thank you very much for your excellent lecture, and I'm very pleased to listen to your lecture. Now I have small questions. I have two questions. One; you mentioned that Dr Snow was chosen as a member of the Society of Epidemiology in London. When was this society founded? The other one is; did Dr Snow know the epidemiological methods at the time of cholera outbreak?

Professor Holland:

The Epidemiological Society in London was founded in 1850. It is important to realise, from about 1838 in England, Edwin Chadwick, a civil servant, and a secretary of the local government board, was very concerned about open sewage, bad housing and polluted air, things like that. In addition to Chadwick, there was a man called John Simon. He was at my hospital, St Thomas's. Simon was the first chief medical officer to the local government of London. He came into conflict with his political masters and resigned in 1866. At the same time Duncan was the first medical officer of health in Liverpool. All these individuals got together to create forum to discuss epidemiological things.

Simon, as the chief medical officer, was quite remarkable. He recruited a series of six or eight senior clinical doctors to undertake surveys in England of the health and of the country. Then as a result showed, the high mortality, high illness rates in the least salubrious part of England, and was able to change the law. England thus became a somewhat cleaner place.

Snow and Simon argued and obviously didn't agree. This

book² states that Simon believed in the miasmatic theory and not in the contagious theory. There is another book we don't read at this time, which actually says that Simon believed in contagion, and not in miasma. One of the greatest fights was in St Thomas's Hospital, my old medical school, because Florence Nightingale believed in miasma, and she wanted St Thomas's to be built on Denmark hill which is up on a hill where there wasn't any miasma rather than down on the Thames where she said there were miasma.

Your question about "Did Snow know epidemiological methods?": the simple answer is no. Like many of us including Richard Doll, there were no courses in epidemiology. I also had no course of epidemiology. We learnt our epidemiology from experience and work. But now there are so many new methods that courses are essential.

Participant C:

I'm afraid this is not a relevant question. When and who made the word epidemiology?

Professor Holland:

I think it's a very old word. As far as I know, the first description of epidemiology by Hippocrates was an outbreak of lead poisoning. I think that's right. Tony (Professor Hedley) may know more.

Professor Hedley:

I think you maybe right. I thought the first lesson to more modern one by German physician but I don't remember.

Professor Holland:

I'm sorry that I didn't finish the question about the Society of Epidemiology. The Epidemiological Society was a part of London Medical Society that became the Royal Society of Medicine. The Royal Society of Medicine has a section of epidemiology and public health medicine. But I don't know where the term epidemiology came from.

Professor Hashimoto:

Even a dictionary of epidemiology just said the definition of epidemiology; no one knows.

Participant D:

Thank you Dr Holland. I just comment I clearly remember the day when I was taught the work of John Snow when I was a medical student. These days I sometimes feel some regretful event which are happening in the Japanese society, such as HIV epidemic among patients who suffered from haemophilia. I think Japanese doctors must develop the knowledge about epidemiology much more. I feel always such kind of things. Thank you very much.

Dr O'Brien:

I think I should remind you one characteristic of John Snow. I think Professor Holland forgot to mention. Although there are public health members who drink wine and spirits, John Snow himself never drank of alcohol.

Professor Holland:

It is interesting actually he used only soft drinks, he didn't smoke, the biography says. I quite agree with him (Dr O'Brien). He preferred soft drinks.

Dr Nakamura:

Please tell me the ISBN of the book.

Professor Holland:

ISBN is; 1-57087-103-5.

Participant E:

Thank you very much for your kind lecture. I have one question. I understand he did his work by using the method of registration of the patients, so who did the first registrational work in the world? Is there anybody before John Snow who did registration in such kind of diseases?

Dr O'Brien:

Probably the registry system in England was started when the Poor Law of 1601 let parish clerks compile burial lists. Maybe the first man was John Graunt who published "Natural and political observation upon the Bills of Mortality" in 1662 in England.

Professor Holland:

I know he wasn't first, but I don't remember who was first.

Participant E:

Thank you. I realise the powerful method of registration, such a fruitful result of registration. I hope registration work in any field for the development in Japan and in Asia. Thank you.

Professor Hashimoto:

Thank you very much for your lecture. It's a good timing just you mentioned O-157 is prevalent in Osaka now. Yesterday's news paper, someone maybe picked up this paper and discussed O-157, illuminating John Snow and reconsidered microbiologists. There were three distinguished doctors discussed O-157. Dr Watanabe, he is a microbiologist. Dr Nakamura translated it in English here. Maybe he was impressed by this paragraph, I'm sure. Anyhow that is very important comment Dr Watanabe said here. Please pick up this paper.

Thank you very much again for your lecture.

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