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Stop Kissing and Steaming!': Tuberculosis and the Occupational Health Movement in the Massachusetts and Lancashire Cotton Weaving Industries, 1870–1918

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Historians of Progressive Era labour legislation and public health have portrayed European governments as leaders in welfare provision, with the United States following their models.¹ In the late nineteenth and early twentieth centuries, Great Britain, in particular, has been characterized as moving towards a 'highly interventionist state apparatus', after it surpassed France during the mid-nineteenth century in terms of leadership in public health reform.² American Progressives, on the other hand, adopted many of the European urban sanitary reform initiatives. They were appealing because they ignored class and promised many community benefits.³ Yet, on both sides of the Atlantic, the relationship between the working environment and this broader urban, public health movement has largely been ignored. Medical historians have analysed cotton workers in terms of their general well being, including health, safety and compensation, or specific illnesses, such as byssinosis, and have emphasised industrial structures or the disease itself.⁴ They have also stressed how Europe instigated many of these reforms before their American counterparts.⁵ Rarely have scholars considered the urban and factory environments together. This article seeks to redress this imbalance with an example from the turn of the twentieth century when Massachusetts' doctors transferred the urban public health discourse surrounding tuberculosis, the primary health scourge of the time, to the weaving room floor with campaigns against the occupational practices of steaming and shuttle kissing and took them to the State Legislature for action. This was in marked contrast to Lancashire where the same public health concerns could have been applied to the same weaving practices, but were not. Instead, the institutions of governance, both central, with Parliament, and local, with the town councils, as well as physicians, kept separate the urban and factory environments. This paper demonstrates that public health and medicine provide a distinct contrast to other welfare and labour issues, with Massachusetts' reforms pre-empting Britain's by many years.

Science in relation to the ideology of health reform will only succeed if the institutions of governance, local and state, allow both policy innovation and the constituents to mobilize, and if these constituents allow the changes to be implemented.⁶ This importance of these relationships in the late nineteenth and early twentieth century is evident through an examination of the local and state government structures in Lancashire and Massachusetts and the responses to the working as compared with the living environment. Britain's centralized government meant legislative decisions came from London; however, town councils played a pivotal role in the interpretation and implementation of Acts of Parliament, and in some cases, opposed them.⁷ Local health reforms had to be approved by town councils as ratepayers paid for them. While some town councils, such as Birmingham

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and Manchester, were active in battling what they perceived to be the contributors to high death rates, including poor sanitation, other councils, including Preston, Lancashire, and Bradford, West Yorkshire, were more reluctant to invest money in improving their residents' health.⁸ In these towns, councillors did not believe the investment would bring sufficient return. Workplace health issues fell further down the priority list, as many town councils viewed these to be the duty of both the state, who should broaden and enforce its policies, and local employers. Furthermore, scientific and medical interest in air quality and diseases centred on the home, not the workplace or the outdoors.⁹

The United States' government comprised a federalist system where more power was held by individual states than the central government in Washington, D.C. Prior to the 1930s, considerable variations in working conditions were found between states as individual state governments determined health legislation, not the federal government. Within this structure, Massachusetts was a highly autonomous political entity, being a pioneer of Progressive legislation for both labour and public health, forming a State Board of Health (BOH) in 1869. Many city governments appointed local, voluntary, BsOH in the mid-1870s, which became mandatory from 1907. From the start, local and State BsOH focused on contagious diseases, placing preventive responsibility on physicians and epidemiologists, with a methodology that combined sanitary science with social reform.¹⁰ Thus, science and the ideology of reform were incorporated into government policy at all levels. The BsOH authority grew during the latter quarter of the nineteenth century, as medical professionals' initial fear and resentment of State intervention into what they perceived to be their domain of health waned. Urban physicians, particularly those in the larger cities of Boston, Lowell, Fall River, Holyoke and New Bedford, realized that if they helped strengthen and broaden the powers of the local and state BOH, they could extend their powers and authority. As a result, city and town BOH physicians found it advantageous to show an active interest in the effect local working environments had on their patients' health and to seek reforms at both the local and State level.¹¹ Industrial health was now firmly incorporated into Massachusetts' urban and State health agendas, which allowed for public and specifically occupational health concerns to be linked.

The unhealthy weaving practices: Medical knowledge and the transmission of tuberculosis

Massachusetts and Lancashire were the worlds' two leading cotton manufacturers between 1870 and 1918 and both weaving trades practiced steaming and shuttle kissing. Steaming involved adding artificial heat and humidity to cotton weaving rooms. High humidity and high temperatures were believed to both decrease thread breakages and to minimize dust levels from the size, a kind of glue commonly used to give cloth a heavier, firmer appearance. The practice rapidly increased during the American Civil War when the quality of available raw cotton was poor and continued into the twentieth century to allow the manufacturing use of many grades of cotton. The damp mill conditions and frequent recycling of water for humidifiers, along with cotton and size dust, created what were seemingly ideal conditions for the diffusion of contagious diseases, particularly in poorly ventilated weaving sheds. Thus, the specifically occupational hazards of fatigue and respiratory problems caused by dust were compounded by the public health risk of spreading contagious diseases such as tuberculosis.

Shuttle kissing was the practice of loading new cops (bobbins) of thread into weaving shuttles. After weavers placed a fresh cop inside the wooden shuttle, they placed the end of the thread against the shuttle eye, put their lips over the outside of the eye and sharply inhaled, thus drawing the thread through the eye, ready for use. During this procedure, weavers directly inhaled dirt, fine lint, size and potentially poisonous chemicals if the thread

was dyed. Weavers repeated the process a minimum of 300 times per day and many years of weaving could cause respiratory illnesses. In addition, shuttles were rarely singular to one weaver. Other weavers or the overseer might also 'kiss' weavers' shuttles, raising questions about the risk of spreading disease, particularly tuberculosis.

Medical knowledge about contagious diseases was in its infancy in the late nineteenth century. The study of diseases correlated causes and cures and clinical consensus about the aetiology of a particular disease was rare. After Robert Koch discovered the tubercle bacillus in 1882 and that it was infectious, a new medical science was formed based on bacteria and scientific analysis. However, little progress was made toward understanding how diseases spread or what affected the outcome of infection, because while most physicians accepted the reality of Koch's bacillus, they debated its meaning and tried to fit its properties into existing ideas of contagion and their clinical experience.¹² Theories abounded, but they were all speculative, with Koch's being dominant in both Britain and America. For more than forty years, Koch and his supporters argued that the tubercle infection was transmitted by dried sputum carried through the air by dust particles. Infection was unlikely through the inhalation of wet sputum from an ill person sneezing or coughing because it was too large and too heavy to remain airborne for long.¹³

Dr. Charles Chapin, Health Officer for Rhode Island, proposed a competing theory to Koch's that fuelled Massachusetts' campaigns to ban the suction shuttle and added scientific 'evidence' to campaigns for reforming the humidification process and improving factory ventilation. Chapin believed that close and prolonged contact between people was necessary to spread the tubercle infection, rather than brief encounters with the bacilli in the air in the street. The primary place of infection was the mouth, rather than the lungs, which raised social concerns in New England factory towns about the connection between tuberculosis, spitting and kissing, which was then transferred into the weaving sheds.¹⁴

The medical establishment through the American Medical Association (AMA) acknowledged a relationship between dust, the spread of tuberculosis and the urban living environment, but not workplace.¹⁵ It was Hermann Biggs, Chief Medical Officer for New York City's Health Department, who, in 1889, connected the infection and contagion of tuberculosis to dust and *any* close contact between people including in the workplace.¹⁶ He convinced the New York Board of Health to require state notification of tuberculosis cases from 1894 and campaigned for education about tuberculosis prevention. Other northeastern states followed, with Rhode Island legislators requiring the notification of TB cases in 1894 and their Massachusetts' counterparts in 1907, with both states emphasising prevention.¹⁷ The Massachusetts' Legislature singled out the textile industries for close factory inspections because vegetable dusts, as opposed to animal, mineral or metallic dusts, were considered the most irritating to the throat, causing increased coughing and 'expectoration', thereby increasing the potential for transmitting TB.¹⁸ Because the State BOH controlled public health matters and city BOH physicians reported directly to the state, factory town councils, particularly those in large cotton manufacturing towns of Lowell, Fall River, New Bedford, Holyoke and Chicopee were forced to address TB in the workplace. City councils had to either encourage manufacturers to voluntarily reform work practices or lobby the State to legislate on the issue to try and reduce the cases of illness. Most councils combined the two approaches, as their constituents were rarely united on the best way to respond to public health concerns in the workplace.

In contrast to New England, British medicine did not base itself around bacteriology until after 1895, and there was no medical consensus before at least 1900 that consumption was a contagious disease.¹⁹ Instead of seeking and addressing environmental causes of disease, most doctors and social reformers emphasised personal responsibility, hygiene habits and

morality as keys to disease prevention. Physicians accepted Koch's discovery, but reserved bacteriological analysis for confirming clinical habits and judgements or for use in doubtful cases.²⁰ Therefore, while TB's contagion was accepted, the 'how' remained debatable and responsibility shifted from physicians to local sanitary authorities, including the Medical Officers of Health (MOsH).²¹ Environment and public health reforms were primarily the responsibility of town councils, with only sporadic state involvement, making both industry-wide and regional policy innovation difficult. MOsH were directly responsible to their local councils and had to adhere to the councils' priorities, which hampered efforts to control TB in the workplace or caused conflict over whether notification was necessary, such as in Manchester. Local authorities were reluctant to regulate the cotton industry as it might provide economic advantages to manufacturers in neighbouring towns and general practitioners (GP's) were afraid of losing patients to the MOH.²² As a result, Lancashire town councils, including those in Preston, Blackburn and Burnley, and their rate paying constituents prioritised the living environment. Addressing issues surrounding TB were further hampered because Parliament did not make compulsory the notification of TB until 1911.²³ Tackling TB in the workplace, including whether or not steaming and shuttle kissing spread TB, was difficult because medical opinion on these issues varied by and within towns. This was because most provincial doctors were slow to learn of developments in clinical and aetiological knowledge, leaving many on the margins of the profession.²⁴ While Massachusetts' doctors faced a similar problem, they benefited from their proximity to Boston and New York, which were increasingly becoming centres of medical and scientific knowledge and from the social movement for health reforms. Some Lancashire doctors, including Manchester's MOH, Dr. Arthur Ransome, championed scientific developments, other MOsH, such as Preston's Henry Pilkington, held less interest due to their position in the local authority, or had less access to clinical developments in London or abroad. The lack of medical consensus about the aetiology of tuberculosis in Lancashire, the MOsH dependency on the town council for employment, their narrowly defined roles in medicine, and their low status within the medical profession, minimized their efforts in campaigns for legislative reform and kept occupational health issues in the local domain.

Lancashire, 1870–1910: The lack of unity about occupational health

The attitudes and efforts of individual MOsH towards public health reform greatly influenced the local discourse on occupational health reform. British historians have argued that during the nineteenth century, state appointed MOsH played a key role in battling infectious diseases and sanitary reform in the urban living environment.²⁵ Yet it was also these urban doctors, not clinical scientists, who recognized workplace health hazards, treated the ill and injured workers, and some of who sought reforms. Three contrasting cases of doctors' actions towards health in the workplace are found in Todmorden, Blackburn and Preston. In 1872, at the behest of the Todmorden weavers' amalgamation, Dr. George Buchanan (MOH) analysed the effects the steaming and sizing processes had on health. He concurred with the weavers that these practices caused various respiratory illnesses and lent his support to a document sent to Parliament requesting reform.²⁶ While weavers gladly accepted his support, response to this paper from either the town council or the state was minimal. In the principle cotton-weaving town of Blackburn, the four MOsH between 1880 and 1911 promoted factory health reform, citing public health concerns, whereas their sole Preston counterpart during this period, Dr. Henry Pilkington, did not. The Blackburn MOsH appealed to both local authorities and cotton manufacturers to reform work practices that could spread disease, including minimizing the spread of germs via workers' spitting, and the regular cleaning of dusty and dirty floors. They sought an end to steaming, arguing that when operatives left hot, damp weaving sheds in wet clothes for the cold winter air, they could contract consumption or other diseases.²⁷ Should steaming be deemed economically essential to the industry, to decrease the risk of contagion, the MOsH recommended that

cloakrooms be provided, ventilation improved and clean water used in the humidifiers - with some success.²⁸ These campaigns gained the town councillors' attention because they fit the broader urban public health agenda and were relatively inexpensive, with manufacturers main investment being the provision of cloakrooms and improving ventilation, most probably with fans.²⁹ Shuttle kissing was not considered as dangerous to health. In 1911, sharing shuttles reputedly caused three cases of Blackburn weavers' consumption and death. The MOH, Dr. Alfred Greenwood, dismissed shuttle kissing as the cause of illness after all three weavers were found alive.³⁰ Little clinical evidence supported a ban on shuttle kissing and a change of practice would require manufacturers to make a substantial financial investment in alternative weaving technologies, of which many were available including hand threaders and automatic looms.

In Preston, a combined spinning and weaving town, the approach to health issues differed. The MOH, Dr. Henry Pilkington, believed only issues that directly affected the entire town, such as sanitation and urban planning, were the town council's responsibility. Similar to many other urban MOsH, including in Manchester and Birmingham, Pilkington worked to improve urban living conditions and successfully lowered the town's mortality rates.³¹ He noted unhealthy working conditions, including the excessive use of steam in weaving sheds and considered these a contributory factor to weavers' high death rates from respiratory diseases, but he did not argue for reform.³² Rather, Pilkington believed industrial reform was the responsibility of central, not local, government. Moreover, current legislation was adequate, including the Cotton Cloth Factories Act and the Factories and Workshops Act; it simply required effective enforcement by the Factory Inspectors.³³

The actions of the MOsH from Todmorden, Preston and Blackburn demonstrate the extent of local variations in beliefs about the responsibility for health within a small region. The MOsH all held similar views of state responsibility for workers, in that costly workplace reforms for health improvements were a legislative responsibility, but they differed in how to bring about appropriate legislation. The Todmorden and Blackburn MOsH appealed directly to Parliament and their town councils for change, while Pilkington simply called for better enforcement of existing laws. Yet, as the Blackburn example demonstrates, one MOH could influence local factory health reforms, demonstrating that the efforts of individual physicians were paramount to instigating local health reforms.

Physicians were less likely to achieve health reforms at an industrial, rather than local, level. They lacked a clinical consensus concerning the tubercular hazards associated with steaming and shuttle kissing, which hampered policy innovation. Articles in the *Lancet* and *British Medical Journal* called for further studies about the effects that inhaling dusty and damp air had on weavers' health.³⁴ Moreover, most physicians viewed weavers as case studies for health problems and as contributors to their own ill health, making connections between class, illness, heredity and unhealthy personal habits, but not type of employment. Most medical professionals kept to their assigned roles and chose not to seek out new problems.³⁵ Combined, class attitudes, the lack of consensus about TB's contagious properties, and the MOsH deference to their employers' priorities, diminished the MOsH power in effecting industry wide legislative factory reforms.

Factory Inspectors represented central government in local communities. Lancashire inspectors were initially sceptical about a relationship between work and illness, but by the late 1880s, this had changed, probably influenced by recent clinical developments. Dust inhalation was now considered 'one of the most unwholesome features of all cotton weaving where there is inadequate ventilation, and which contains fermentation cells, and other floating germs'.³⁶ As a result, in 1889 and again 1901, Factory Inspectors sought, and achieved, legislative regulation of steaming and ventilation in cotton weaving sheds. They

did not seek abolition of the practice because manufacturers deemed steaming necessary for production and they overlooked the potential for disease to spread via shuttle kissing, either through dust inhalation or sharing shuttles. These were sanitary issues and were the local authorities' responsibility. The state sought to balance health concerns about Lancashire workers with national economic concerns and the vital role the cotton industry played within this. The latter was the priority.

It was the Lancashire weavers' from many towns, including Blackburn, Burnley, Preston, Nelson, Colne, and Darwen, among others, who mobilized to take their campaigns to minimize occupational health risks, including steaming, size dust and shuttle kissing from local to central government as they considered legislation necessary to achieve industrial health reform.³⁷ Although they did not always understand clinical explanations for disease contagion, their testimony at Home Office enquiries and in the operatives' newspaper, the *Cotton Factory Times*, demonstrates weavers linked their ill health to the factory environment, especially the humidity, dust and tuberculosis and that they used scientific explanations about their causes for evidence – possibly transferring some of the anxieties about harmful air pollutants in their homes to the factories.³⁸ In 1888 and again in 1906, the Weavers' Amalgamation petitioned Parliament to ban steaming in cotton mills on health grounds, but without widespread medical and societal support for change, they failed.³⁹ Instead, Parliamentary occupational health legislation focussed on visible workplace hazards, including decreasing the number of accidents, providing compensation for injuries and improving factory sanitation. It neglected risks specific to individual tasks and invisible occupational illnesses – in this case, respiratory. Accidents, public health and occupational illnesses were distinct areas of government interest and responsibility in Britain (national, local, but with national assistance, and national). While some town councils, such as Blackburn, sought industrial reforms in the immediate area, the urban health agenda of most Lancashire town councils, including Manchester and Preston, prioritised building regulations, sanitation and sewers, over issues affecting specific occupations, industries or groups of individuals.⁴⁰

Massachusetts, 1880–1918: The success of urban public responsibility

Progressive Era social reformers in Massachusetts sought to control work hazards, including accidents, hygiene, sanitation, ventilation and some specifically occupational risks, such as industrial poisons. Alongside this, welfare campaigners urged manufacturers to voluntarily improve safety standards and encouraged workers to avoid carelessness on the job.⁴¹ Educational campaigns sought to teach people appropriate personal hygiene standards and practices. This broad reform movement influenced cotton town physicians, who combined these priorities with specifically local health concerns and those pronounced by the State Board of Health. The Massachusetts' BOH incorporated public interest in sanitary science into its agenda for preventing the spread of contagious diseases. They targeted densely populated factory towns where TB incidents were the highest in the state, including the cotton towns of Fall River, New Bedford, Lowell and Chicopee. The Legislature extended the Board of Health's authority into the workplace after scientists linked TB closely to the dusty trades in 1905. Cotton town BOH doctors gained the power to examine mill operatives for infectious and contagious diseases and to inspect working conditions. They repeatedly connected cotton dust with respiratory illness amongst operatives.⁴² These urban public health doctors had acquired a clinical role that their British counterparts lacked, although their authority and willingness to act was limited. The legislation had not granted BOH doctors the authority to remove ill workers from the factory and raised concerns about preserving patient/physician confidentiality. For example, the Fall River BOH physician, Dr. Adam MacKnight, saw cotton operatives as private patients and noted health problems ranging from occupational injuries to tuberculosis and other respiratory illnesses that he

suspected were contracted at work. Yet, MacKnight found few operatives willing to file a report that stated the cause of their illness or injury and that included their name. This was because time off work reduced incomes that were already barely sufficient to survive; a tuberculosis diagnosis could have long-term economic repercussions for the patient's family; and, as a result, they would be unable to pay for medical care.⁴³ Thus, patient loyalty made local doctors reluctant to report tuberculosis cases to the State Board of Health, even after this became mandatory from 1907. Cotton town physicians argued that reporting TB cases broke doctor-patient confidentiality, infringed professional autonomy, challenged medical judgment and could end a physician's ability to prescribe individual treatments.⁴⁴ These professional limitations in aiding sick individuals led some local BOH doctors to strive for broader reforms at both the local and state level. They encouraged personal hygiene and safety, promoted employer welfare, and took specifically local health concerns to the State Legislature for resolution through industrial regulation.

Medical men's collective urban health reform efforts included improving water supplies and sewage and refuse removal, as well as peoples' general health. They found partners with public-minded citizens and engineers, working under the banner of sanitary science.⁴⁵ In textile towns such as Lowell and Lawrence, they fought to switch water supplies from the polluted Merrimack River to local wells, while the towns of Chicopee and Holyoke underwent similar campaigns to prevent sewage being dumped in the water supplies. The water-born bacteria were connected with the high death rates from certain water-born diseases, particularly typhoid.⁴⁶ This campaign was transferred to public places, as 'knowledgeable' reformers posted circulars in public places and factories to educate the public about unhygienic private behaviors, including washing, spitting and kissing.⁴⁷ They appealed to their town councils to regulate or ban spitting in public places in an effort to minimize the number of TB cases. Cotton town physicians, such as MacKnight, transferred these urban hygiene campaigns to factory reform campaigns via the suction shuttle and brought them to the attention of the State BOH so that in 1906, the Board labeled the suction shuttle a 'bad, unhygienic habit', because the weaver drew 'into his mouth more or less fine lint and dust, which gives rise to spitting.'⁴⁸ While this description points to an occupational, rather than a contagious disease, both the state BOH and local physicians emphasized the unhygienic practice of sharing shuttles.⁴⁹ In other words, physicians acknowledged that certain work practices were uncomfortable, but did not recognize any specific health risks attributable to dust inhalation. Instead, they focused on the dominant urban health discourse surrounding reducing the cases of contagious diseases and improving hygiene. However, it was because physicians in Fall River, Fitchburg, New Bedford, Lawrence and Lowell, had linked the spread of contagious diseases in their towns to work practices that the State government was forced to include the latter in its public health agenda.

Cotton town BOH doctors, including those in Fall River and Fitchburg, also brought the practice of humidifying the weaving and spinning rooms to the State Board's scrutiny, by arguing that it held the potential to spread TB infected sputum through the spray.⁵⁰ This contributed to the Massachusetts' Legislature decision to pass a series of Acts between 1907 and 1910 that regulated humidity levels and atmospheric temperatures in the mills, increased ventilation requirements, mandated only clean water be used for humidifiers and increased the BOH physicians' authority to address specific occupational practices that affected workers' health.⁵¹ Combined, these Acts increased the State's authority to intervene in local communities and workplaces and affirmed a view of their responsibility for public health as incorporating both the city and the workplace. Moreover, the State still did not require specifically occupational illnesses to be reported unless there was an additional public health risk. Thus, any Legislative intervention in the workplace would have to aid the general, collective, health of the working population, not simply the health of individuals.

By 1910, local and State health agendas were firmly entwined. That year, a State investigation of the inspection of factories linked the spread of tuberculosis to weavers' sharing shuttles. During their investigation, Legislators held hearings in the neighboring cotton towns of Fall River and New Bedford, considering testimony from weavers, union members, factory inspectors and medical professionals. Fall River weavers Joseph Parks, representing organized labour, and Charles Rafferty, who was also a shuttle inventor, Joseph Jackson, a former mill worker and Secretary of the Slashers' Tenders' Union, and Matthew Hart of New Bedford, representing both weavers and the Textile Council, all testified that using the suction shuttle caused respiratory problems and spread contagious diseases. They described the health risks in the language of the dominant health discourse of TB, although some witnesses clearly described other illnesses, including byssinosis, the disease whereby operatives' lungs are slowly clogged with cotton dust over years of exposure.⁵² Their arguments for banning the suction shuttle emphasized the economic and collective health benefits of such legislation. Rafferty argued that 'if the operative fails in health and fails in wealth, the State fails in wealth.'⁵³ Jackson sought the end of the suction shuttle, 'not for the sake of the individual, but for the sake of the general public health.'⁵⁴ Emphasizing the benefits to public health and safety and the State's economic prosperity rather than specific occupational illnesses affecting individuals was necessary to gain the attention of Legislators who did not want to place restrictive legislation on the State's largest industry, but who sought to improve the populations' general health. Moreover, operatives did not possess the medical knowledge or terminology necessary to describe byssinosis; whereas the TB education campaigns meant that most workers had some knowledge about its aetiology. Cotton town physicians had succeeded, with the help of social reformers, adding the workplace to both the local and state's public health reform agendas at both the local and State levels.

Physicians from both the State BOH and textile towns provided 'expert' testimony about the public health risks from sharing shuttles. For example, Dr. William C. Hanson, Assistant Secretary to the State Board of Health, believed using the suction shuttle was unhealthier than sharing a drinking cup and recommended the practice be regulated 'to a certain extent'.⁵⁵ Dr. William Hall Coon from Lawrence thought it dangerous when 'a person ill with tuberculosis has left the mill and a spare hand comes in and takes that shuttle.'⁵⁶ There was also the dramatic testimony of Dr. J. W. Coughlin from Fall River, which was the culminating speech for persuading the Hearing that legislation banning the suction shuttle was necessary. He stated

I am interested, Mr. Chairman, in the protection of those who use an instrument like this (a shuttle) because I believe if there to be in this whole State an instrument of greater destruction, I do not know it. I believe that is a curse, and the greatest menace that has ever confronted the operative who is compelled to earn his bread by its use. I believe that no human lips can touch that wood that has become infected by the virus of tuberculosis without imparting it to the lips of a virgin constitution and ultimately impregnating that constitution and destroying that life...;

Now I won't say that families have been disrupted by death by infection from this source, I have got no proof that this is so. Inferences are not facts, Mr. Chairman; and yet I have seen conditions that have led me to believe that death has come from the shuttle.... What must the danger be in that, where the weaver, wavering and tottering at her looms, whose life is almost on the verge of extinguishment, who goes home and dies of tuberculosis and an innocent operative comes and sucks that shuttle.... [taking] possibly, some of that dry [tubercular] material down into her lungs containing the fine virus when it may be said to be in the most virulent state, which we know will cause death.⁵⁷

Although Coughlin admitted a tenuous link between sharing shuttles and tuberculosis deaths, his emotional appeal stressed local health risks. The testimony of cotton town physicians about the health dangers in their cities allowed them to enter the State political arena and argue for preventive medical-industrial legislation. These physicians had made the vital connection between health and work, and broadened the public health agenda to include the workplace.⁵⁸ This, combined with education campaigns informing citizens about the dangers of the tubercle bacillus, meant the State had acquired the authority to regulate industry for the public good. The 1911 Massachusetts' legislation banning the suction shuttle was passed from the desire to decrease the spread of TB.⁵⁹ The prevention of a potential occupational health risk, byssinosis, possibly caused by years of weaving with a suction shuttle, was purely coincidental. State medical officers did not relate using the suction shuttle with respiratory ill health, nor was the State interested in occupational illnesses without a connection to contagious diseases and even this interest was marginal, as the legislation was not rigidly enforced. The State was interested in the collective health of working populations, not that of individuals. The methods for achieving this goal included reducing contagious and infectious diseases, preventing accidents and injuries, and providing compensation for those injured.⁶⁰ All three were similar to the British government's priorities. The difference lay in that the Massachusetts Legislature held an open view about the remits of public health that allowed local doctors to attach the workplace to the agenda, whereas the British government held a limited definition of urban public-health responsibility.

The following year saw the social concerns about contagious diseases further influence reforms in the Massachusetts' cotton weaving industry with a State commissioned clinical study to determine relationships between humidification techniques and the spread of disease. Published in 1912, this study demonstrated that in weaving rooms where spray humidifiers were used, the bacteria count was far higher than in rooms without such devices.⁶¹ It emphasized the epidemiological theory that germs were carried in wet droplets and transmitted to others through inhalation or direct contact and incorporated concern about operatives' fatigue from long hours working in hot, humid rooms, an issue about which some manufacturers also expressed unease.⁶² The results were related to the State's goal of improving the well being of urban dwellers and they persuaded many cotton employers to voluntarily lower humidity levels and/or change technology to 'germ free' humidifiers, believing that improvements to workers' health would correlate with increased productivity. This concern was a natural by-product of the Progressive Era, where employers tried various forms of welfare to stem increasing urban labour unrest without impeding production.⁶³ While cotton manufacturers never entirely committed themselves to welfare or the State's urban health agenda, their successful efforts at weaving without spray humidifiers could be viewed as a four-fold success: workers' health improved as the potential spread of contagious diseases decreased; productivity increased as workers' fatigue decreased; further legislative intervention in industry was prevented by the voluntary reduction of a potential public health risk, and responsibility for operatives' health was returned to the workers.⁶⁴ Yet, some Massachusetts' cotton manufacturers, including in Fall River, New Bedford and Lowell, as well as their southern counterparts ignored the scientific advice about atmospheric controls or chose not to invest in new technology. As a result, workers' complaints about high levels of heat and humidity in some weaving rooms persisted after World War II.⁶⁵ At this historical juncture, the joint social and public health agendas of the Massachusetts' public and Legislature allowed city BOH physicians to mobilize the support of other local physicians, labour, engineers and social reformers to influence State policy and to pressurize local businessmen, without their unanimous support.⁶⁶

Thus, occupational health reform in Progressive Era Massachusetts evolved as cotton town physicians expanded the public health discourse to incorporate both the urban living

environment and the workplace and as they gradually pushed this onto the State's health agenda. It briefly united doctors, workers, legislators and occasionally business to lobby towards this common goal. Although this unity of urban living and workplace health discourses was short-lived, as was reformers influence on state policy due to the increasing influence of business on government, these early reforms mark the beginning of factory reform for illness prevention.

Lancashire, 1910–18: Continued disunity

The expansion of preventive medicine in Lancashire factory towns was limited by the MOsH successes at urban sanitary reform and the common idea that public health and hygiene reform only included structural works, such as building sewers and improving water supplies.⁶⁷ Although the MOsH remit broadened during the late nineteenth and early twentieth century, the factory health agenda focused on sanitary reforms, which fit the urban, Lancashire and national health priorities. However, some Lancashire MOsH continued to lend professional support to their local weavers' health reform campaigns. For example, in 1910, the MOsH for Bacup, North Burnley and Nelson attributed the spread of tuberculosis in their towns to weavers' sharing shuttles, with contagion via the sputum left on the shuttles.⁶⁸ These health risks were defined within the urban public health discourse; however, the weavers added the specifically occupational concern of dust inhalation.⁶⁹ In 1911, the Amalgamated Weavers' Association enquired of their Lancashire members their objections to the suction shuttle. The principle complaint was the risk of spreading diseases, followed closely by injuries to teeth and inhaling dirt and dust into their lungs.⁷⁰ Several branches cited their MOH and other local physicians' support for their claims. With no single health risk attributable to the practice to unite reformers or a clear medical consensus about any relationship with TB, as well as manufacturers' strong opposition to government regulation of business, there lacked a strong case to ensure the issue reached the Parliamentary agenda before the Massachusetts' ban.

The Massachusetts' legislation forced Parliament to consider the Lancashire weavers' health concerns. A committee was appointed to investigate the alleged health hazards associated with the use of the suction shuttle in the cotton towns. The members collected evidence from Lancashire MOsH, Certifying Surgeons, local doctors and dentists, whose testimony took priority over that of the weavers'. The majority of Lancashire MOsH (89%) continued to use the 'hygiene' discourse for describing the hazards of shuttle kissing. They believed it should be 'rendered unnecessary', because sharing shuttles either contributed to cancer of the mouth, tuberculosis, tonsillitis, phthisis, tooth decay, or diphtheria. Other doctors testified that there were no apparent health risks attached to the practice.⁷¹ Yet, all physicians ignored the potential respiratory dangers from inhaling dust and dirt and mostly linked these issues to urban living. The condemnation of the practice by many local MOsH directly confronted town council and Parliamentary policy questions - the liberty of the individual versus the good of the state; immediate economy or long-term economic investment in technology, health and labour.⁷² To resolve this dilemma, the Committee collected testimony on the issue from other countries, including the United States. This evidence was later declared 'unreliable' without a clear explanation, but was possibly in response to the Cotton Employers' Association's arguments that manufacturers maintained the interests of all aspects of their industry, including their workers' well-being, and that government intervention would cripple the trade.⁷³ The Committee concluded that shuttle kissing was both unpleasant and unsanitary and that it *could* allow for the transmission of disease between two people. Nevertheless, as no individual case of disease contagion had been found, and without a consensual argument from the Lancashire constituencies, or a clear link to the public health agenda, Parliament refused to ban the practice as a preventative measure for the collective well-being of labour. Instead, they recommended disinfecting shuttles and

weavers' regular cleaning of their teeth should suffice.⁷⁴ The State had absolved itself of the responsibility for health policy innovation in the workplace and deflected responsibility for disease prevention back to individuals, requiring weavers to reform their work practices and personal hygiene.⁷⁵ In 1913, in response to their Lancashire constituents continued complaints, Parliament conceded to establish a Shuttle Kissing Committee to conduct further enquiries about whether a new threading device was economically practicable – not whether it was medically necessary. This clearly demonstrated that policy priorities emphasised economic interests before workers' health.

Cotton town physicians and weavers were now forced to revise their arguments for reforming unhealthy work practices to also incorporate an economic discourse and to seek reforms from both local and state government. For example, in 1915, Mr. A. Middleton Hewat, Preston's Tuberculosis Officer and Assistant MOH, attributed weavers' high rates of tuberculosis, the highest of any group of Preston cotton operatives, to the sharing of shuttles, advocating 'the substitution of a hand-threaded shuttle or a mechanical shuttle-kisser.'⁷⁶ Hewat pointedly did not mention the Northrop Loom that was developed in Massachusetts and which automatically loaded shuttles with new cops of thread, raised production speeds for many types of cloth, and which was increasingly popular amongst Massachusetts' employers.⁷⁷ While Hewat probably knew of the Northrop as there were over 5000 in use in Lancashire, including at the Preston firm Horrocks, Crewdson and Co., he considered the financial implications to local manufacturers by mentioning cheaper technological alternatives.⁷⁸ Factory reform campaigns now centered on economic issues at both the local and state levels, with both public and occupational health issues being marginalized, unlike in Massachusetts where these had been linked.

World War I interrupted industrial reform efforts, but they resumed afterwards. In 1919, the Parliamentary Shuttle Kissing Committee classed the practice as a technological issue alongside accidents and injuries. They recommended abolition of the suction shuttle and the substitution of an alternative technology, but delegated the final decision to local governments and businesses. The Lancashire town councils refused to take a stance left the decision to the industry. The Weavers' Amalgamation endorsed the Parliamentary recommendation, but sought to appease manufacturers. They conceded economic practicalities about new technologies with exemptions for classes of cloth where hand threaders were impracticable and a five-year phasing in period to deplete current stocks of shuttles.⁷⁹ The Lancashire Cotton Spinners' and Manufacturers' Association rejected the weavers' compromise, opposing a mandatory ban of suction shuttles on the principle that manufacturers needed the freedom to conduct business as they saw fit. However, they agreed to recommend the use of hand threaders where possible, provided operatives agreed to use them. Again, responsibility for workplace health had been deflected from central to local government and industry, from local government to industry, and from manufacturers to individual operatives. Both state and local government refused to place the health of workers before economics, listening to the voice of the minority, business, rather than the majority of their Lancashire constituents and experts – the cotton weavers and physicians.

The interwar economic slump enabled manufacturers' to ignore their agreement, as industrial survival took priority. Thereafter, physicians faded from the debate as business practicalities took priority over workers' health. The Lancashire Weavers' Amalgamation led initiatives to find efficient, cost-effective technological alternatives to the suction shuttle through negotiations with local manufacturers. When Parliament finally banned the practice in 1952, it was because suction shuttles were no longer technologically efficient or necessary. No health risks were attributed to the practice, nor did town councils or the public visibly accept any responsibility for workers' health.

The steaming story is similar, with the lack of consensus about health risks, a belief in its economic necessity for manufacturing cloth and the state deflecting responsibility for health to local authorities and individuals. In both 1911 and 1914, the Home Office collected testimony from various Lancashire towns, including Blackburn, Preston, Darwen and Great Harwood, about the effects working in a hot, humid environment had on the industry and operatives' health. The weavers highlighted fatigue issues; the overlookers stressed the discomfort of humidity and wearing damp clothes when leaving the shed; the manufacturers highlighted the economic necessity of steaming; and the physicians attributed various health problems to the use of steam, including stunted growth, but who emphasized abolishing the practice could not be justified purely on medical grounds, and who did not connect the issue to broader public health concerns.⁸⁰ The voluntary reductions/reforms in the use of steam by Massachusetts' manufacturers and Clark and Gage's 1912 Report on the hygiene effects attributable to the use of humidity went unnoticed in Lancashire. The physicians' testimony enabled manufacturers to convince the Home Secretary that as steaming posed no definite health risk to workers and was essential for the weaving process it should not be banned.⁸¹ Despite this setback, the Lancashire weavers continued their campaigns for the legislative abolition of, or at least further regulations for, humidification. After World War I, there remained a lack of a united medical condemnation of the health risks attributable to steaming. The practice was declared merely uncomfortable.⁸² As a result, Lancashire town councils and Parliament saw little reason to interfere in industry. Over the next fifteen years, several Lancashire MP's submitted private members' bills to Parliament to reform and further regulate the practice – with little success. Cotton manufacturers successfully denied steaming posed any health risks; blamed the victims for their own ill health; deemed the practice vital to industrial production and prevented its abolition by convincing Parliament and town councils this was an industrial issue, not a governmental one.⁸³ Weavers' campaigns to ban the practice essentially ended after Home Office Reports in 1927 and 1928 'proved' steaming was not detrimental to health and aided weaving.⁸⁴ Manufacturers now had national government and medical support for their claims that weaving was a healthy occupation and they could avoid changing work practices and responsibility for weavers' claims of ill health.

The minimal factory health reform in Lancashire, as compared with Massachusetts, does not demonstrate a complete inactivity in the area of reforming working conditions. In many Lancashire towns, the MOsH improved factory sanitary standards and ensured the regular use of clean water for humidifiers. Thus, they extended public health to include sanitation but not issues specific to occupations. At the state level, they had aided the anti-steaming campaigns that resulted in regulations of the practice with the 1901, 1907 and 1911 Factory Acts.⁸⁵ However, unlike their Massachusetts' counterparts the physicians did not utilize clinical knowledge to connect steaming with the public health discourse surrounding contagious diseases, especially TB. Without a broadening of the definition of public health to include both the city and the workplaces, Parliament continued to emphasize an urban living discourse. Not surprisingly, town councils and MOsH adopted this focus and successfully reduced cases of infectious disease and improved sanitation and people's nutrition – to the neglect of the workforce.⁸⁶

The key problem hindering the reform of unhealthy work practices in the Lancashire weaving industry lay in perceptions of responsibility for workers' ill health. Unlike in Massachusetts, the region had not developed a widely inclusive definition of public health. Rather, they firmly separated the public health of the city from the private health of the individual. The visible, urban environment was the focus of the Parliamentary health agenda. While some local exceptions have been discussed, most Lancashire MOsH fit their scientific knowledge about disease contagion to this agenda, rather than addressing related issues in the workplace, whereas their Massachusetts' counterparts considered both. The

resulting lack of professional medical and clinical consensus about the ill-effects to health from steaming and shuttle kissing; the emphasis on the urban living environment; manufacturers' strong opposition to governmental intervention (local and state); and the deflection of responsibility for health by the different groups, makes it unsurprising that occupational health regulation was repeatedly delayed.

Conclusion

During this period and earlier, the British government, far more than the American, either federal or state, has been associated with government intervention and social reform, albeit frequently with a cautious tone.⁸⁷ This article has demonstrated a counter case where early twentieth century Massachusetts' Progressives assigned environmental rather than individual responsibility to the spread of tuberculosis in weaving sheds – much earlier than their British counterparts. It has highlighted how institutions of governance operated differently at both the local and state level in Massachusetts and Britain to influence the campaign for health reforms in the cotton weaving industry. The Massachusetts' case was unique in America, with few other state governments taking significant interest in workplace health. It was a state-wide belief in a definition of public health that incorporated both the living and working environments that was the key influence behind the State Legislature's decision to ban shuttle kissing and a broad acceptance of clinical science, including experts' explanations of the health risks attributable to steaming. Local physicians made the vital connection between health and work, tapping social concerns about tuberculosis and transferring them from the urban living to the working environment. They enlisted the help of city governments, reformers and operatives and influenced local and state political and economic action, including legislative reform. Urban town councils recognized the limitations of their authority within their community and particularly amongst businessmen and were thus willing to campaign the State for legislative intervention to achieve local benefits.

In contrast, British central and local governments emphasised the health of the masses through building physical structures, such as improved water supplies, and placed responsibility for health care on individuals rather than the environment. Businessmen's powerful influence in local and national politics made officials reluctant to impose strong or expensive regulations on industry, even when market forces suggested otherwise. Lancashire County was behind the rest of Britain in that its town councils were the slowest at establishing local public health boards and many delayed appointing a MOH. Thus, it is unsurprising that few Lancashire MOsH challenged their employers', the town councils', priority of the urban living discourse. Most MOsH did not entirely ignore the workplace and a few transferred their clinical knowledge about tuberculosis contagion from the living to the working environment, but they also believed their official responsibilities were limited to the inspection and regulation of factory sanitation.

This sole example of the Massachusetts' Legislature's reform of working conditions for the prevention of tuberculosis is insufficient to counter the many other health reforms that Britain developed before the United States, most notably national health insurance. Yet, the Massachusetts case does suggest the potential power of reforms specific to regional interests under a devolved government, even though the likelihood of reform is less than under a centralized government where specific regional or industrial concerns can be easily lost in broader economic and political agendas.

It would be wrong to solely commend or blame any one group of actors for the success or failure of legislative health reforms in the cotton weaving industry. In both countries, the various actors were influenced by the beliefs and actions of the others. Yet, in

Massachusetts, the various local groups united around their common goal of improving the public's health in all environments and in working together for reforms at the city and state level. Lancashire reformers lacked a common goal or a united health discourse, resulting in few reforms in weaving towns and little effective health legislation.

The beliefs and actions of the various participants in the occupational health discourse need further examination for other regions and industries, as does the course of technological developments in work processes that affected the health of the workers.⁸⁸ Additional examinations of the ecology of the workplace will further understandings of relationships between health, labour, technology and market forces.⁸⁹ These studies may also illuminate further cases where an American state was more progressive towards health reform than its European counterparts. In both countries, the period 1870–1918 marks the collective recognition of visible relationships between work and health in terms of accidents, injuries and compensation, but not necessarily the invisible, including disease, noise and fatigue. At this particular historical juncture, laboratory science, medical practice and reform united in Massachusetts and good health was related to economic progress, urban structures, public health and good governance. In Britain, these issues remained predominately separate. By 1918 in both countries, the reform of work practices in the cotton weaving industry remained in its infancy. Weavers were still subject to fatigue from long hours in hot, humid conditions and continuous exposure to high decibels of noise from clattering machinery. They were still injured, and occasionally killed, by flying shuttles and through other industrial accidents. The weaving rooms were far from safe places to work.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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70. LRO DDX 1123/6/2/129 Shuttle Kissing File, 1911.
71. B. P. P. 1912–13, [Cd. 6184] xxvi, Report to the Home Office and to the Local Government Board upon an Inquiry into the Alleged Danger of the Transmission of Certain Diseases from Person to Person in Weaving Sheds by means of 'Shuttle-Kissing' (hereafter Shuttle Kissing Report), 104–81 Blackburn Annual Report for 1911. :154. LRO HRBL 2/1/18. Clarke A. The Effects of the Factory System. Littleborough, 1899. 1985:43.
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