

Miasmas, Rhetoric and the British Public Health Response to the 1918-20 Influenza Pandemic

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Abstract

This paper argues that in Britain the public health responses to control of the 1918-20 influenza pandemic owed more to a longstanding medical motif centred particularly around the importance of fresh air, often associated with miasmatic ideas, than to prevalent germ theory. Corruption of the air, miasma, was considered by many to be the means of transmission of influenza until it was supplanted by germ theory in the last decades of the nineteenth century. By the time of the 1918-20 influenza pandemic, miasmatic theory was obsolete and had no serious medical advocates. Influenza was assumed to be transmitted through an infecting germ although the causative organism was unclear and was the subject of considerable debate.

When the influenza epidemic struck Britain in 1918 the government and public expected authoritative advice from the medical establishment regarding its control and prevention. This paper argues that doctors fell back upon older rhetoric and traditions which they traced back ultimately to Hippocrates in their recommendations. The rationale offered by medical professionals for measures such as ventilation of rooms and the avoidance of crowded spaces is reminiscent of traditional notions of healthy *versus* corrupt air or miasmas rather than germ theory. Similarly British practitioners rejected measures such as the wearing of masks for which the rationale was germ-based. In contrast, doctors in the United States were generally more convinced that *Bacillus influenzae* was the causative organism and enthusiastically embraced measures such as public mask-wearing for influenza control.

Keywords

Miasma theory, pandemic, influenza, public health, rhetoric

Miasma

The air has been considered a source of disease and especially epidemic disease since antiquity. The term ‘miasma’ originates from the Greek for pollution or defilement, and until the end of the nineteenth century ideas associated with it formed the basis of a variety of accounts which described how diseases arose from corrupt air. Sometimes, according to the theory, miasmatic corruption was detectable by the unaided senses, for example through the smell of decomposing matter or as visible disease-carrying fog. Miasmas may also be imperceptible. The earliest written versions of miasmatic theory are found in the Hippocratic corpus; in *On the Nature of Man* Hippocrates suggests: ‘Whenever many men are attacked by one disease at the same time, the cause should be assigned to that which is most common, and which we all use most. This it is which we breathe in’.¹

Miasma theories faced few serious challenges as an explanation for disease transmission until the final decades of the nineteenth century when they were increasingly supplanted by germ theory, which held that every transmissible disease had a specific, identifiable causative organism. However, the rhetoric of the importance of fresh air persisted, frequently without any reference to germ theory. During the influenza pandemic of 1889-90 many doctors in Britain still held to miasmatic theories of causation and transmission and Medical Officers of Health felt it necessary to dismiss these ‘Continental’ miasmatic notions of ‘... influenza passing like a cloud which obeys the caprice of the night, traverses at the same time and in the course of a few days the distance between towns situated at the four corners of the earth’ and impress upon general practitioners that the disease passed instead by contagion, that is from contact with an infected person.²

The cause of influenza

By the time of the 1918-20 influenza pandemic, miasmatic views were effectively obsolete. No medical practitioners advocated them and medical consensus held that influenza was transmitted by an organism, a ‘virus’ (the term then referred to any unknown disease-causing germ or particle rather than its present meaning), spread within microscopic water droplets in exhaled air. In a review of the aetiology of influenza the British Medical Research Council concluded in 1918 that ‘the infection is disseminated by personal contact’ by ‘drop-infection from person to person’ though the report emphasised that the nature of the causative organism remained unclear.³

The principal candidate was *Bacillus influenzae*, or Pfeiffer’s bacillus, isolated from influenza patients by the German bacteriologist Richard Pfeiffer (1858-1945) in 1892

¹ Hippocrates of Cos. *Nature of Man*. In: Jones WHS, *Hippocrates with an English Translation, Volume IV*. London: William Heinemann; 1931, p.93.

² Sisley R. *A Study of Influenza and the Laws of England concerning Infectious Diseases*. London: Longmans, Green and Co; 1892, p.16.

³ Anon. The Etiology of Influenza. *British Medical Journal*. 1918; 2(3018): 494-495.

and deemed by him to be the cause of influenza.⁴ Although *B. influenzae* (the bacterium now known as *Haemophilus influenzae*) had its advocates there remained considerable scepticism, particularly among British clinicians, as to whether it was the real cause of flu.^{5 6 7 8 9} Many workers in Britain had failed to isolate *B. influenzae* from patients with flu and rejected claims from advocates of *B. influenzae* that it was a particularly difficult organism to isolate or the accusation that their failure to do so represented faulty technique.^{10 11} When workers did culture *B. influenzae* they frequently isolated other organisms alongside it and used this finding to suggest that it was not specific to influenza or that a commensal relationship between *B. influenzae* and other organisms might be responsible for influenza infection.^{12 13}

In October 1918 Charles Nicolle (1866-1936) and his assistant at the Pasteur Institute in Tunis dealt a further blow to the causal role of *B. influenzae* when they passed a solution derived from a flu patient's bronchial mucus through a porcelain filter sufficiently fine to exclude bacteria. The resultant liquid, inoculated into monkeys, appeared to cause influenza symptoms and the workers concluded that the causative organism might not be a bacterium at all but a smaller, unknown particle or 'virus'.¹⁴

Advocates of *B. influenzae* said the French findings could not be replicated due to faulty technique such as cracked filters or that the causative bacterium passed through various stages in its development, some of which might be sufficiently minute to pass through a filter.^{15 16 17} The debate continued unresolved throughout the 1918-20 pandemic, and authoritative medical opinion in Britain simply considered that the cause of flu remained uncertain – one commentator, a leading medical practitioner, wearily considered that all the recent scientific activity had left the profession 'even further away from exact knowledge on the point than we thought we were eighteen months ago'.¹⁸

By this time, however, professional medical and scientific expertise was sufficiently well respected that Government and the public expected authoritative advice regarding

⁴ Pfeiffer R. Die Aetiologie der Influenza. *Zeitschrift für Hygiene und Infektionskrankheiten*. 1893; 13: 357-386.

⁵ Ford Robertson W. Influenza: Its cause and prevention. *British Medical Journal*. 1918; 2(3025): 680-681.

⁶ Anon. The Pandemic of Influenza. *British Medical Journal*. 1918; 2(3004): 91-92.

⁷ Crofton WM. Cause, prevention and treatment of influenza. *British Medical Journal*. 1919; 1(3035): 240-241.

⁸ Crofton WM. The cause of influenza. *British Medical Journal*. 1922; 2(3214): 234.

⁹ Anon. Experimental production of influenza. *British Medical Journal*. 1920; 1(3086): 267.

¹⁰ Anon, Etiology of Influenza, 1918 (Note 3).

¹¹ Camac Wilkinson W. Vaccines in influenza. *British Medical Journal*, 1918; 2(3020): 558.

¹² Gotch OH, Whittingham HE. A report on the "influenza" epidemic of 1918. *British Medical Journal*. 1918; 2(3004): 82-85.

¹³ Anon. Influenza again. *British Medical Journal*. 1919; 2(3069): 541.

¹⁴ Nicolle C, Lebaillly C. Quelques notions expérimentales sur le virus de la grippe. *Comptes rendus de l'Académie des Sciences*. 1918; 167 :607-610.

¹⁵ Crofton, Cause, prevention and treatment, 1919 (Note 7).

¹⁶ Crofton, Cause of influenza, 1922 (Note 8).

¹⁷ Donaldson R. The etiology of influenza. *British Medical Journal*. 1918; 2(3025): 701.

¹⁸ Horder T. Preventive treatment of influenza. *British Medical Journal*. 1919; 2(3074): 695-698.

measures to prevent and mitigate flu, despite medical controversy concerning the causative organism. In the absence of any consensus regarding the cause of flu, I argue that doctors fell back upon the older, familiar rhetoric of fresh air, incorporating its miasmatic associations, to formulate recommendations for disease control.

Ventilation

The historian Christopher Lawrence has argued that English physicians at this time held themselves as inheritors of a unique empirical tradition which they traced back to Hippocrates via such figures as Harvey, Sydenham, John Hunter, Jenner and Lister, and which they considered offered a down-to-earth, common-sense style of medical practice in contrast to the ‘theoretical’ tendency of continental medicine.¹⁹ The rhetoric employed by these physicians in response to the influenza pandemic, I suggest, relies heavily on such beliefs, including notions of ‘healthy’ and ‘unhealthy’ air derived ultimately from Hippocrates and the importance of ventilation which was emphasised in particular by Thomas Sydenham (1624-1689) who wrote of diseases occasioned by ‘the manifest qualities of the air’ and is often credited with introducing fresh air into the sick room in order that the patient might be ‘restored by fresh air’.^{20 21}

Throughout the pandemic doctors widely and enthusiastically advocated ventilation of rooms by opening doors and windows, and spending as much time as possible outdoors, as preventive measures against influenza. Laura Spinney, in her review of the 1918-20 pandemic, considers that this extensive promotion might form the origin of our current persisting enthusiasm for fresh air.²² Ventilation can be made entirely compatible with germ theory and the model of person-to-person transmission by contagion as experience with our recent coronavirus pandemic has demonstrated. However, doctors advocating ventilation in 1918 made no mention of diluting or dispersing germs, which is the current rationale for such measures. Rather they appeared to revert to a traditional rhetoric of dissipating corrupt or unhealthy air and considered that fresh air had intrinsic positive health-promoting properties.

Sir Arthur Newsome (1857-1943), Medical Officer to the Local Government Board, advised the public simply to ‘Flush continuously with air each occupied bed room and living room’.²³ Sir Thomas Horder (1871-1955), physician at St Bartholomew’s hospital later to become ennobled and a physician to the royal household, wrote of the therapeutic value of fresh air without mentioning germs but rather using the longstanding rhetoric of the virtues of fresh air in the aforementioned Hippocratic tradition. Horder, also an enthusiastic admirer of Sydenham, wrote:

¹⁹ Lawrence C. Edward Jenner’s jockey boots and the great tradition in English medicine 1918-1939. In: Lawrence C, Mayer AK, *Regenerating England: Science, Medicine and Culture in Inter-War Britain*. Amsterdam: Rodopi; 2000, p.45-66.

²⁰ Sydenham T. *Works Volume 1*. London: Sydenham Society; 1848, p.34.

²¹ Sydenham, *Works*, 1848 (Note 20), p.147.

²² Spinney L. *Pale Rider: The Spanish Flu of 1918 and How it Changed the World*. London: Jonathan Cape, 2017.

²³ Anon. Influenza still spreading: Precautions against infection. *The Times*, 22 Oct 1918, p.3.

I regard the most important thing by far to be a free current of fresh air. It has not only the most important therapeutic value for the patient, it is also of great value as a preventive against spread of the infection. Winds appear to “break up” an epidemic wave; a current of fresh air, it seems quite certain, is our most potent defence in the case of the individual patient.²⁴

The Royal College of Physicians also promoted ventilation largely due to the implicit health-giving effects of fresh air rather than with reference to its effects on germs or their distribution: ‘Well ventilated, airy rooms promote well-being, and to that extent at any rate are inimical to infection; draughts are due to unskilful ventilation, and are harmful’.²⁵ The Halifax GP Andrew Garvie expressed his enthusiasm for strong currents of fresh air in similar terms to Horder, believing they were ‘beneficial in breaking up the virulence of an epidemic’ and put his conviction into practice, smashing the sealed window of a flu patient’s stuffy room with a rolling pin borrowed from a neighbour.²⁶ The patient and her sick child, he reported, rapidly improved – inexplicable, it would appear, on grounds of dispersing germs but redolent of Sydenham and of miasmatic accounts of the need for the expulsion and replacement of foul air.

Even the clinician-physiologist Leonard Hill (1866-1952), a vocal advocate of ventilation, described how fresh air conveyed specific health benefits unrelated to the dispersal of germs. He speculated that cool dry air might benefit patients by increasing blood supply to respiratory mucus membranes and encouraging the flow of catarrh and lymph; ‘In this, I claim, lies one explanation of the good effect of open-air treatment, and the ill effect of crowded tenements’.²⁷ His rationale made no reference transmission of germs:

To combat the influenza infection, then, I would urge the deep breathing of cool air, brought about by exercise, sleeping in open air, and as an adjunct any spray, gargle, or snuff which enhances the outflow of secretion from the respiratory membrane of the nose and throat.²⁸

Closure of transport and ‘public places of amusement’

Contagion theory and the notion of person-to-person transmission through germs in respiratory water droplets were used by some to support the view that restricting overcrowding and large gatherings might reduce disease spread. Such measures were adopted across the country by local medical officers including those in Cambridge, Leeds and Liverpool who closed or restricted access to schools, cinemas, theatres and

²⁴ Horder, Preventive treatment, 1919 (Note 18), p.697.

²⁵ Royal College of Physicians of London. Prevention and treatment of influenza. *British Medical Journal*. 1918; 2(3020): 546.

²⁶ Garvie A. The spread of influenza in an industrial area. *British Medical Journal*. 1919; 2((3069): 519-523.

²⁷ Hill L. The defence of the respiratory membrane against influenza, etc. *British Medical Journal*. 1919; 1(3035): 238-240.

²⁸ Hill, The defence of the respiratory membrane, 1919 (Note 27), p.239.

music halls.^{29 30 31} These actions do not however appear to have been particularly prioritised; the Birmingham Medical Officer briefly noted that ‘Cinemas were closed’ but emphasised the variation in individual susceptibility to influenza; ‘a large part of the whole population escaped the disease although frequently exposed to the infection, e.g. doctors, nurses and those looking after the sick’.³² But a substantial section of medical opinion was frequently sceptical about the value of such measures and incorporated older, pre-germ theory rhetoric in the debate.

An editorialist in the *British Medical Journal*, whilst warning that ‘The risk of contracting the infection is increased by the aggregation of susceptible persons in ill-ventilated and overcrowded conditions’, considered that individual susceptibility was the most important determinant of disease severity and opined ‘it must be said that no municipal regulations are of any avail’, concluding in favour of the old, familiar, traditional adage of ‘living as much as possible in the fresh air’.³³ Thomas Horder even suggested that closing public spaces would increase infection by forcing people back into the corrupted air of their homes: ‘Forbidding public amusements, as has been pointed out, may drive a good many people into worse atmospheres in their own homes’.³⁴

Towards the end of the pandemic the Chief Medical Officer George Newman (1870-1948) considered that ‘It became evident at an early date that attempts to control an epidemic by school closure and regulation of places of public entertainment were useless’ and in his report for the Ministry of Health he even questioned earlier notions of influenza transmission by droplet spread and dismissed ‘measures for closing places of public gatherings and entertainment’ as ‘of little value or even futile’ though he did bemoan the dangers of extreme overcrowding such as on transport ships.^{35 36}

Facemasks

Rationally, if anachronistically, we might expect facemasks to inhibit transmission of influenza germs spread through respiratory droplets, whilst they would be ineffective against miasma as they are not hermetically sealed and cannot prevent ingress of the air itself. The consensus that influenza germs spread via respiratory droplets did lead to

²⁹ Cambridgeshire County Council. *Annual Report of the Medical Officer of Health for the Administrative County of Cambridge for the Year 1918*. Cambridge: Cambridge Express Printing Co; 1918.

³⁰ Angus W. *Report on the Health and Sanitary Administration of the City for the Year 1918*. Leeds: Leeds City Council; 1918.

³¹ Hope EW. *Report on the Health of the City of Liverpool during the year 1918*. Liverpool: C Tinling & Co; 1919.

³² City of Birmingham. *Report of the Medical Officer of Health for the year 1918*. Birmingham: Hudson and Son; 1919.

³³ Anon. Influenza again? *British Medical Journal*. 1919; 2(3069): 541.

³⁴ Horder, Preventive treatment, 1919 (Note 18), p.697.

³⁵ Anon. Public Health in 1918-19. *British Medical Journal*. 1920; 1(3083): 164.

³⁶ Newman G. *Annual Report of the Chief Medical Officer 1919-1920*. London: HMSO; 1920, p.47.

calls for the general wearing of facemasks and *The Times* newspaper consistently promoted their use.³⁷ Published clinical data on their effectiveness or otherwise was scarce, but such information as was available did appear to support the wearing of masks. One study compared two voyages of the American troop-carrier SS *Olympic* carrying soldiers from America to Southampton. The first voyage, conducted with no requirement for wearing facemasks, resulted in over 1,500 cases of flu and 300 deaths. During the next voyage masks were mandatory resulting in just 34 cases of flu and no deaths, although the authors pointed out that potential flu cases were screened out prior to embarkation on this second voyage.³⁸ However despite such data and the germ-based rationale that masks might inhibit the spread of droplet-borne pathogens, mainstream British medical opinion was highly sceptical of their value. Establishment figures echoed the recommendations of the Local Government Board and Ministry of Health that, although masks might be a useful preventive measure for medical personnel attending numerous influenza patients, the public was ‘not advised to make general use of face masks’ during the prevalence of influenza.³⁹ Newman suggested that they were valueless for controlling public spread.⁴¹

Some of this resistance appeared to be due to concerns that a civilian population, newly released from wartime restrictions and privations, would not tolerate such further impositions on their behaviour or that imposing mask-wearing would ‘engender fear’ and ‘breed panic’ but other objections concerned the validity of medical facts and theory.⁴² Dr (later Sir) Hector MacKenzie (1856-1929), speaking at a conference at the Institute of Hygiene in London on the prevention of influenza, appeared to reject established notions of individual droplet spread in favour of a miasma-like cloud of corrupting germs: ‘The wearing of masks for the general public he considered unpractical. Seeing that the micro-organism was so extremely minute, he thought the amount of protection a mask would afford, unless made of some material like glass, would be very small’.⁴⁴ Leonard Hill, who considered that the health-promoting quality of fresh air lay in its cooling properties, even suggested that mask-wearing could increase an individual’s susceptibility to influenza infection by corrupting inhaled air: ‘The wearing of a mask by raising the temperature and humidity of the air breathed is against the natural defensive mechanism.’⁴⁵

This approach, employing a rhetoric of the non-specific nature of influenza spread, contrasted with medical opinion in the United States. There, *B. influenzae* was more widely publicised as the cause of influenza. The American surgeon-general unequivocally declared it to be so in 1918, and some results from American laboratories

³⁷ Anon. The prevention of influenza: Use of mask. *The Times*, 19 December 1918, p.5; The prevention of influenza: Official advice. *The Times*, 22 February 1919, p.10.

³⁸ Anon. Means for the control of influenza. *British Medical Journal*. 1919; 1(3035): 248-249.

³⁹ Anon, Means for the control, 1919 (Note 40), p.248.

⁴⁰ Anon. Prevention of influenza: Memorandum by the Ministry of Health. *British Medical Journal*. 1920; 1(3079), p.19.

⁴¹ Newman. *Annual Report*, 1920 (Note 36), p.47.

⁴² Described in Spinney, *Pale Rider*, 2017 (Note 22), p.102.

⁴³ Horder, Preventive treatment, 1919 (Note 18), p.697.

⁴⁴ Anon. Influenza and its prevention. *The Times*, 1 March 1919, p.7.

⁴⁵ Hill, The defence of the respiratory membrane, 1919 (Note 27), p.239.

were initially at variance with European findings, including those reporting a failure to replicate Nicolle and Lebailly's demonstration of a filter-passing particle and claims by Blake and Cecil in Washington to have induced influenza in monkeys with a strain of *B. influenzae* whose virulence had been potentiated by passing it through mice.^{46 47} Corresponding with this germ-orientated notion of influenza spread, mask-wearing was much more prominent in the USA. Colonel Washburn, chief surgeon at Base Section 3, an American military hospital in London, tried to persuade his British colleagues of the scientific basis for employing facemasks, 'Theoretically, of course, it [the facemask] should be a valuable prophylactic measure' and in American military hospitals it was mandatory that 'all attendants, doctors, nurses and visitors' should wear masks when seeing influenza patients.⁴⁸



Figure 1. Women wearing surgical masks during the influenza epidemic, Brisbane, 1919. Credit: State Library of Queensland, Australia.

In the USA mask-wearing was mandated by several states and punishments for transgression included fines of up to \$100 or ten days' imprisonment. The Red Cross advised American civilians to 'Wear a mask and save your life!' and reassured them that 'A gauze mask is 99% *proof* against influenza'.⁴⁹ American doctors, possibly swayed by the more widespread conviction that *B. influenzae* was responsible for flu, appeared to be adopting a germ-based rationale for the containment of influenza whereas their

⁴⁶Rosenau MJ. Experiments to determine mode of spread of influenza. *Journal of the American Medical Association*. 1919; 73: 311-313.

⁴⁷ Blake FG. and Cecil RL. The production of an acute respiratory disease in monkeys by inoculation with Bacillus influenzae. *Journal of the American Medical Association*. 1920; 74: 170-172.

⁴⁸ Anon, Means for the control, 1919 (Note 38), p.248.

⁴⁹ Barry JM. Pandemics: avoiding the mistakes of 1918. *Nature*. 2009; 459: 324-325.

British colleagues did not do so to the same extent and instead adopted an older rhetoric of disease dispersal.

Smoke, mists and miasmas

The historian Tom Quinn notes that British doctors took to smoking pipes while treating flu patients during the 1918-20 pandemic ‘in the hope that smoke might prevent the transmission of the disease’.⁵⁰ For decades doctors had speculated that tobacco smoke might convey antibacterial qualities but that does not appear to be the predominant rationale here.⁵¹ If smoke were intended to scour the respiratory tract of germs it would surely be inhaled in a cigarette, drawing this health-promoting substance as far into the body as possible, then exhaled through the throat and nose. Instead, doctors opted for pipes, whose smoke is not generally inhaled but which can create an impressive fug. This is arguably reminiscent of techniques employed from medieval times to counter miasmas by burning wet wood to overwhelm miasma with smoke or encouraging children to smoke to avoid the London plague of 1665 and suggests an older rationale, that is attempting to overwhelm corrupt air around the influenza patient with strong-smelling tobacco smoke.⁵²

Industrial fumes were also suggested as a possible protection against flu. In 1919 Captain Alexander Gregor, Medical Officer of Health for Falmouth, pointed to the ‘accepted fact among men working in gaseous fumes that they are practically immune from nasal catarrh and respiratory diseases in general’ and noted the widespread ‘custom to take children suffering from whooping cough to the nearest gasworks and expose them to the fumes emanating from the oxide of iron purifiers’.⁵³ He observed fewer cases of flu, not only among workers in tin mines, cordite factories and gas works but also among inhabitants of houses close to these works and concluded that ‘it would seem that the popular belief in the cure of “colds in the head” by fumes has a foundation of truth’.⁵⁴ His suggestion that such fumes might offer a widespread means of protection against influenza infection was enthusiastically received. The *British Medical Journal* looked forward to such preventive measures being adopted ‘in schools, colleges, workshops, and large business establishments’ and suggested that ‘inhaling rooms’ be ‘placed at the disposal of those more careful members of the public who were disposed to make use of it’.⁵⁵ Thomas Horder hoped airborne gases would provide ‘a practical method of control in the future’.⁵⁶

The observation that workers involved in the production of chlorine-based poison gas appeared to enjoy similar invulnerability to influenza prompted Gregor to speculate

⁵⁰ Quinn T. *Flu: A social history of influenza*. London: New Holland; 2008, p.139.

⁵¹ Anon. Does smoking protect against infection? *British Medical Journal*. 1889; 2(1492): 253.

⁵² Charlton A. Medicinal uses of tobacco in history. *Journal of the Royal Society of Medicine*. 2004; 97: 292-296.

⁵³ Gregor A. A note on the epidemiology of influenza among workers. *British Medical Journal*. 1919; 1(3035): 242-243.

⁵⁴ Gregor, A note on the epidemiology, 1919 (Note 53), p.243.

⁵⁵ Anon. The prevention of influenza. *British Medical Journal*. 1919; 2(3070): 570.

⁵⁶ Horder, Preventive treatment, 1919 (Note 18), p.697.

that the protection offered by industrial fumes might operate through the bactericidal properties of chemicals such as sulphur dioxide or nitrous oxide within them and he performed experiments which appeared to suggest that such gases could inhibit the growth of bacteria normally found in the nasopharynx.^{57 58} *In vivo* evidence of any useful antibacterial effect was however lacking and, in the absence of any consensus regarding the causative organism of influenza or indeed whether a bacterium was responsible at all, suggestions regarding the mode of action of gases or chemical mists were essentially speculative. To advocate that such measures be employed (despite initial enthusiasm, there appear to have been few serious attempts to utilise airborne gases in this way) was an empirical measure based on common traditions and folklore which harked back to older notions of overwhelming corrupted air with pungent fumes.

Conclusion

Historians have noted the spread of miasmatic beliefs among the public during the 1918-20 influenza pandemic. In his social history of influenza Tom Quinn argues that the pandemic precipitated a resurgence of belief in older notions of the origins and transmission of flu: ‘Old ideas about the origins of illness re-emerged. In London it was blamed on mists rising from Flanders fields disturbed by millions of exploding shells’.⁵⁹ Laura Spinney agrees in her account of the 1918-20 pandemic in Britain and concludes that ordinary people ‘grasped the concept of contagion, but not the mechanism’.⁶⁰ And Catharine Arnold describes the popular belief that the air itself was poisonous, leading the public to adopt measures such as sealing windows and doors.⁶¹ However this latent reliance on older notions of disease transmission also appears to have influenced the rhetoric surrounding the medical response to the 1918-20 pandemic. Preventive measures were sometimes given a post-hoc veneer of germ-based justification that was arguably unconvincing or inconsistent, for example Leonard Hill’s arguments about the effect of cold air on mucus membranes or the speculation regarding bactericidal properties of tobacco smoke or industrial fumes, but they appear to have derived from traditional assumptions about the virtues and dangers of fresh or corrupt air.

Some other preventive measures which were suggested offered nonspecific advice to promote an individual’s resistance to flu, including encouragement to eat nourishing food, keep in good general health and avoid alcoholic excess.⁶² Others, such as instructions to gargle regularly with disinfectant or to burn tissues after sneezing or blowing one’s nose into them, do appear to carry a germ-based theoretical rationale,

⁵⁷ Shufflebotham F. Influenza among poison gas workers. *British Medical Journal*. 1919; 1(3042): 478-479.

⁵⁸ Gregor A. The scope of certain gaseous disinfectants in the prophylaxis of influenza. *British Medical Journal*. 1919; 2(3069): 523-527.

⁵⁹ Quinn, *Flu*, 2008 (Note 50), p.140.

⁶⁰ Spinney, *Pale Rider*, 2017 (Note 22), p.31.

⁶¹ Arnold C. *Pandemic 1918: The story of the deadliest influenza in history*. London: Michael O’Mara Books; 2018, p.160.

⁶² Royal College of Physicians, Prevention and treatment, 1918 (Note 25), p.546.

although lacking any empirical verification.⁶³ Many other measures, as this paper has attempted to demonstrate, were however couched in older terms, frequently relying on miasmatic notions of disease transmission. British doctors and medical bodies were expected to provide authoritative practical advice for the control and prevention of influenza infection in 1918. In the absence of definitive evidence regarding the efficacy of any proposed measures, or the causative organism of influenza, their rhetoric reverted to older notions of disease spread and control.

Miasmatic notions of disease transmission retain an intuitive hold on popular understanding of disease spread even today and for some, formed an implicit ‘mental model’ for the spread of COVID-19 in the recent pandemic.⁶⁴ In 1918 they perhaps constituted part of a venerated tradition which English doctors could trace back to Hippocrates and which they regarded as uniquely their own, offering a familiar paradigm which offered definitive preventive options where germ theory could not.

⁶³ Royal College of Physicians, Prevention and treatment, 1918 (Note 25), p.546.

⁶⁴ Greenhalgh T. Miasmas, mental models and preventive public health: some philosophical reflections on science in the COVID-19 pandemic. *Interface Focus*. 11: 20210017 <https://royalsocietypublishing.org/> (accessed 28 February 2022).

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