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## HOW INFECTION SHAPED HISTORY: LESSONS FROM THE IRISH FAMINE

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### Abstract

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Human history has been profoundly affected by infection throughout the millennia. In most cases, the impact has been a direct consequence of infection in humans. However, in the 1840s, a plant infection — potato blight, caused by the fungus *Phytophthora infestans* — showed us how an environmental catastrophe in a vulnerable community can profoundly affect human history. Before the visitation of potato blight, the population of Ireland was the most rapidly growing in Europe in the early 1840s. Yet between 1845 and 1850, Ireland's population fell by over one-third — with 3 million people disappearing from the island — half through death and half through emigration. This directly led to a subsequent diaspora of almost 80 million people, many destined for residence in the Americas. The diaspora carried enormous consequences for the social, economic, and political development of the US.

Today, lessons from the Irish famine remain poignant and relevant. Social science maps the dimensions of a disaster dependent on the size of its impact and the relative vulnerability of the society which experiences the disaster. Ireland's vulnerability was in terms of its overall poverty and its dependence on the potato as a subsistence crop. However, a critical factor in the disaster was the political structure in which it occurred — where governance was unwilling and unable to respond to the needs of the population.

### INTRODUCTION

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The health effects of a major environmental challenge to humans are very often dependent on influences outside the direct impact of the environmental insult itself. This has been true throughout human history and has been evident during recent major disasters, such as the hurricanes in New Orleans in 2006 and in Puerto Rico in 2017, or the Ebola outbreak in West Africa from 2014–2016. The environmental event will have immediate effects (death and injury during extreme weather events, for example) but the overall effect on population health is strongly dependent on

the demographic and social circumstances where the event occurs and the political and economic conditions that determine societal responses to these cataclysmic events. This article will explore the effects of a novel epidemic infection affecting a uniquely susceptible population leading to the Irish Famine from 1845–1849.

## BACKGROUND

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Although Henry II of England claimed the throne of Ireland in 1170, it was not until Tudor times and the reign of Henry VII in 1490 that a series of wars of conquest of the island of Ireland began, lasting until the final victory for the English crown in 1691. The intervening years were punctuated by a series of colonizations of conquered Irish chiefdoms. Settlers from England, and notably lowland Scotland, were given land confiscated from the native Irish. These wars were exacerbated by religious differences, in that the native Irish retained the Roman Catholic faith, whereas the colonists were almost exclusively Protestant. By the end of the military phase of the English conquest of Ireland (1691) most of the arable land in Ireland was in the hands of the colonists, whose ascendancy was assured by a series of Penal laws enacted to deprive Catholics of their civil rights and assure that political and economic control of Ireland remained in the hands of the Protestant minority population. By the end of the 18<sup>th</sup> century, most of the land of Ireland was in the possession of a minority of landholders, many of whom lived in England. The majority of the Irish population worked as tenants or laborers on the land, most as extremely poor subsistence farmers.

## IMPORTANCE OF THE POTATO

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By the late 17<sup>th</sup> century, the potato was widely used in Ireland to supplement main diet of dairy and grain products. Over time, Irish tenants were pushed off the better land and forced to farm smaller plots of marginal land. Increasingly, they turned to the potato, as it was a crop that could be grown abundantly in less favorable soil, and was sufficiently nutritious to provide general sustenance.

By first two decades of 18<sup>th</sup> century it had become base food of the poor. Most potatoes grown in Ireland were a single variety, the Irish Lumper. Holdings were so small that no crop other than potatoes would suffice to feed a family. By 1841, there were more than half a million peasant farmers, with 1.75 million dependents. The British government reported in 1843 that poverty was so widespread that one-third of all Irish small holdings could not support their families after paying their rent except by earnings of seasonal migrant labor in England and Scotland.

## POTATO BLIGHT

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The earliest reports of a potato blight appeared the United States, in Philadelphia and New York City, in early 1843. This was caused by the fungus *Phytophthora infestans* which spreads rapidly in the foliage of potatoes causing collapse and decay of the plant. The disease spreads most readily during periods of warm and humid weather with rain. It is assumed that winds then spread the spores, and by 1845, potato blight was found across the Eastern part of the United States and Canada. It then crossed the Atlantic, probably with a shipment of seed potatoes for Belgian farm-

ers in 1845. All of the potato-growing countries in Europe were affected. By years-end, the disease had spread throughout Belgium and Holland, and into an area from northern Spain to the southern tips of Scandinavia, and east to Northern Italy. It moved inexorably through the British Isles and reached Ireland's west coast, by mid-October 1845. The ruin of Europe's potato crops was complete, but the potato blight hit Ireland the hardest. Ireland had a disproportionate dependency on the Irish Lumper, a single variety of potato. The lack of genetic variability in the Irish potato population created a susceptible host population for the organism.

The consequences for the Irish potato crop over the next few years were devastating. In 1845, it was estimated that one-third to one-half of the cultivated acreage of potatoes was infected, whereas three-quarters of the harvest was lost to blight in the following year. There was less blight in 1847, but the effects of the prior 2 years of severity meant that seed potatoes were scarce and very little had been sown, leading consequently to a harvest much lower than normal. By 1848, yields approached two-thirds of normal and the overall effect of the blight was mitigated.

The human consequences of this potato blight were disastrous. The index year, 1845, saw widespread reports of hunger across the country but there were no excess deaths. The first reports of famine death occurred in 1846 and the famine became established in 1847 (known colloquially as Black '47) when at least 400,000 deaths were reported. We will probably never be completely certain of the actual death toll in the Irish famine. The census in 1841 showed a population in Ireland of 8,175,124; in 1851, it was 6,552,385. In the first 40 years of 19<sup>th</sup> century, the Irish population had the highest growth rate in Europe and projections based on the prior growth rate suggest that the 1851 population should have been more than 9 million. Thus, it is reasonable to assume that in the decade after 1841 (which included the severest Famine years), between 2.5 and 3 million people (almost one-third of the population) disappeared from the island of Ireland. Current thinking is that 1 to 1.5 million people died and 1 to 1.5 million people emigrated from Ireland between 1841 and 1851.

The causes of death in the Irish famine were myriad and contemporaneous records have allowed some assessment of how and why people died in this period (1). Surprisingly, the direct consequences of lack of food or quality of food (i.e., starvation and/or vitamin deficiency diseases) probably accounted for only 10% to 15% of deaths. There were undoubtedly indirect consequences of malnutrition and vitamin deficiency which increased susceptibility to other causes of mortality — for example, through physical weakness, psychologic depression, or immunosuppression.

There are many contemporary references to fever which is now believed to be mostly typhoid, relapsing fever, and typhus — diseases spread by close contact, fleas, and body lice. The famine led to many people abandoning their homesteads in search of work and or food and the many vagrants and famine refugees on the roads produced a new term for these diseases, "road fever." Levels of personal hygiene were low in that era, especially among the poor. Personal care, child-care, and food preparation were further neglected when energy levels declined. Starvation also led to relative immunodeficiency and increased susceptibility to ongoing common infections, and outbreaks of cholera, smallpox, and respiratory illnesses were reported during this time. Overall, it is believed that fever and other infections accounted for up to 50% of deaths during the Famine.

Famine victims were also susceptible to digestive diseases due to decline in food quality. As the food supply diminished in quantity, desperate people slid down the quality ladder falling back on items that would normally not be eaten: seaweeds, diseased and spoiled foods, and wild plants. There is evidence of increased prevalence of diarrheal illnesses — some of which may be direct effect of poor, indigestible food and others related to gastroenteritis either from contaminated food or spread from person-to-person.

One of the great ironies of the history of this time was that during the famine years, Ireland was, in fact, a food-producing country. In 1845, for example, more than 25 million bushels of corn were exported to Britain from Ireland. The export of livestock to Britain increased during the famine years. In total, more than 3 million live animals were exported from Ireland between 1846 and 1850 to British ports. Almost 4,000 vessels carried food from Ireland to the ports of Bristol, Glasgow, Liverpool, and London during 1847, when 400,000 Irish men, women, and children died of starvation and related diseases. This is not necessarily an unusual situation. It must be realized that poverty was endemic in Ireland, and the poor would not have been able to afford the produce that was being exported from the country, unless there was very significant subsidization. Such an approach would have been very unusual anywhere in the 1840s.

## GOVERNMENT RESPONSE

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The question must be asked, however — why did such a devastating famine occur on an island that produced more than enough food to feed its population? The dependence of a very poor populace on a single staple crop would inevitably lead to some food shortages, hunger, and death among the poor if and when that staple crop failed. However, the dimensions of the disaster were not inevitable. Fundamentally, the impact of this profound crop failure was the consequence of political decisions taken by those who governed Ireland and reflected prevailing attitudes on the role of government. As John Mitchel, a contemporary Irish revolutionary, noted “The Almighty, indeed, sent the potato blight, but the English created the famine.”

In 1845, the initial response of Conservative British government, led by Sir Robert Peel, to the early less-severe phase of the famine was reasonably prompt and included importation of maize and cornmeal secretly from America, and the establishment of a program of public works. At that time, Britain maintained the so-called Corn Laws, which imposed heavy duties on imported grain to ensure that it could never be cheaper than home-grown produce. Peel recognized that the Corn Laws would need to be repealed to allow for public relief and the importation of cheap grain, especially from the Americas. However, this was vehemently opposed by Conservative land-owners, and repeal of the Corn Laws split the Conservative Party, leading to the fall of Peel's ministry. The prevailing political philosophy of the new Whig Government was laissez-faire — in other words, government had no place interfering with or regulating the economy. This approach held that markets would provide the food needed and they halted the previous government's food and relief works.

However, in addition to the economic argument, there was a fundamental, almost philosophical, approach to poor and socially “less-advanced” populations in general, and to Ireland in particular, among the English Ruling classes. This was not a socially enlightened time that assumed that a role

of government should be to eliminate poverty and its consequences. Significant poverty and deprivation already existed in Britain and across its empire. Political classes in London debated as to whether feeding the starving Irish with free food might set up culture of dependency. This debate among the English governing class was tinged by racism and class superiority. The minister with significant authority for Ireland, Sir Charles Trevelyan, wrote that the Irish national character was "defective," and that the Irish were "a selfish, perverse, and turbulent" people. He thought "the judgment of God sent the calamity to teach the Irish a lesson." Indeed, it should be recalled that when Thomas Malthus set forward his thesis on the economic and social impact of natural catastrophes 50 years previously, he referred to Ireland as a prime example: "... the land in Ireland is infinitely more peopled than in England; and to give full effect to the natural resources of the country, a great part of the population should be swept from the soil."

By January 1847, the effects of the famine were severe enough to cause the government to abandon its policy of noninterference, and they turned to a mixture of "indoor" and "outdoor" direct relief; the former administered in workhouses through Irish Poor Laws; the latter through soup kitchens. The costs of the Poor Law fell primarily on the local landlords, some of whom in turn attempted to reduce their liability by evicting their tenants. This was facilitated through the "Cheap Ejectment Acts." Furthermore, the "Gregory clause" of the Poor Law prohibited anyone who held at least one-fourth of an acre from receiving relief. This clause forced many to abandon their homes to obtain food, increasing the internal migrations which contributed to contagion. Crowding starving people into workhouses also increased mortality as the workhouses became breeding grounds for infectious diseases, especially typhus and diarrheal illnesses.

By the fall of 1848, the potato harvest had recovered and, although there were continuing shortages and pockets of ongoing starvation, the direct effects of famine diminished over the ensuing years. Indirect effects were more sustained.

## EMIGRATION

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A long-lasting consequence of the famine on Ireland was emigration. Although emigration from Ireland (especially to the United States) preceded the famine, it exploded as a social phenomenon during and after the famine years. It is estimated that at least 1.3 million people left Ireland between 1846 and 1852 — most to North America (~700,000), Britain (~400,000), and Australia. Passage, especially to North America, was not easy. The mortality on so-called "coffin ships" ranged from 5% to 30% — usually due to infectious diseases. The degree of morbidity and debility associated with the transatlantic passage was also considerable. For example, at the arrival point of Grosse Isle, in Quebec, Canada, as many as 20,000 deaths from typhus and other fevers were recorded among arriving emigrants in 1847.

The effect of this emigration on the United States was profound. In last census (2011), almost 40 million Americans claimed Irish ethnicity. Many can trace their ancestry to the famine era from 1845–1852 when 300 Irish would disembark daily in New York. By 1850, the United States had almost 1 million citizens of Irish origin, 43% of whom were born in Ireland; and the Irish comprised 43% of all foreign-born population of the US at that time. New York City had the largest amount of Irish emigration; by 1855, 26% of the population in Manhattan was Irish. Although initially unpop-

ular (leading to substantial nativist activity in the mid-1850s), Irish immigration helped to give the United States a major resource needed to keep its economy expanding — new labor — and, over time, the Irish grew to be a highly accepted element of the American melting-pot.

Emigration became the norm in Ireland after the famine. It is estimated that the Irish Diaspora (descendants of those who emigrated from the island) worldwide is approximately 80 million people, about half of whom are in the US. Ireland has never fully recovered from the famine. Indeed, the population living on the island decreased with every census until the late 20<sup>th</sup> century, and even now the population of the island is less than that in the mid-1840s. We also have very little insight into the long-lasting effects — medical and psychologic — of the famine on those who survived; but modern experiences, such as seen in the survivors of the 1944 famine in the Netherlands, suggest they were likely to be profound and cross generations ([2,3](#)).

## CONCLUSION

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As we look back nearly 2 centuries later, it is reasonable to consider whether the death toll and social consequences of the Irish famine were avoidable. The dimensions of a disaster depend on the size of the impact and the vulnerability of the society that experiences the disaster. It can be argued that that Ireland was extremely unlucky for a number of interconnected reasons when the continent of Europe encountered the potato blight in 1845. The blight affected potatoes across the continent; however, Ireland had a vulnerability because of the lack of genetic variability among the potatoes which limited the emergence of blight-resistant plants — a fact that was critical when *Phytophthora* infection returned the following season in 1846. Ireland's vulnerability was compounded by its overall poverty, and the dependence of a large population on a single staple crop. As famines in India and Africa showed later in the 19<sup>th</sup> and 20<sup>th</sup> centuries, failure of a staple crop has its greatest burden on the poor who cannot afford to replace their dependency on a single crop with more expensive alternatives, even when they are locally available. An additional dimension to the scale of the disaster was that all populations of the time were vulnerable to an increase in the incidence of infectious diseases in the case of outside shocks. A lack of basic understanding of public health and the nature of transmission of infectious diseases facilitated the spread of typhus and other louse-borne diseases, diarrheal diseases, and respiratory infections. Had *Phytophthora infestans* attacked only a few decades later, a better understanding of the basic mechanisms of death would likely have influenced public health policy and would have saved many lives. However, even if more scientifically informed public health measures had been in place, it is likely that the death toll would have been considerable, especially among the poor. In that context, the response of civil society, particularly in the form of food relief, would have been key in addressing the environmental calamity — failure of the staple crop,

A critical factor in the disaster, therefore, was the political structure in which it occurred — where the governance of the country did not respond to the needs of the population being governed. This is particularly apt when one considers that Ireland was still exporting food to Britain during the famine. Governmental indifference, neglect, or deliberate inaction all contributed to the death toll of the Irish Famine. It was fitting, therefore, that 150 years later, the British Prime Minister, Tony Blair, apologized for the role played by the British Government. As he appropriately said,

*The famine was a defining event in the history of Ireland and Britain. It has left deep scars. That 1 million people should have died in what was then part of the richest and most powerful nation in the world is something that still causes pain as we reflect on it today. Those who governed in London at the time failed their people through standing by while a crop failure turned into a massive human tragedy.*

## Footnotes

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Potential Conflicts of Interest: None to disclose.

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