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# Peak oil: Will it be public health's greatest challenge?

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**Summary** The health of populations is determined more by the social and economic determinants of health than by changes in technology, health services or short-term policy interventions. In the near future, there is likely to be a significant shortfall in energy supply, resulting in high energy prices and a reversal of many of the aspects of globalization that are currently taken for granted. If this happens, economic recession and restructuring could have a negative impact on health, not dissimilar to that experienced by the former Soviet Union when it attempted a rapid change in its economy. There is, however, the potential, through economic planning and sustainable development, to reduce the adverse effects of this change and use this opportunity to impact on a range of diseases which are, at least in part, caused by overconsumption, inequality and loss of community.

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## Introduction

Throughout history, the health of populations has been altered more by economic and social change operating over decades than by short-term policy interventions.<sup>1</sup> However, the discourse of the medical profession remains dominated by technical innovations, refinement of treatment regimes and short-term policy debates. In contrast, inevitable

changes in the supply and demand of global energy and climate change have the potential to cause impacts on health that will eclipse the relevance of most other current health debates. Climate change has now forced its way on to the health agenda.<sup>2,3</sup> A less recognized threat is known as 'peak oil' or 'Hubbert's blip', which is set to bring the age of cheap oil to an end in the near future.<sup>4</sup> This will occur not when oil runs out, but after only half of the oil reserves have been used; the production peak. This is likely to have a large negative and sustained impact on Western economies in the future, as multiple facets of these societies are built upon the cheap availability of oil.<sup>5</sup> Through

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the impact on economic circumstances, the dwindling availability of energy resources is likely to be one of the biggest challenges for public health in the foreseeable future.

## Peak oil

The concern that health is likely to be compromised by an economic shock related to oil scarcity is based upon the growing mismatch between oil discovery and production (Fig. 1).<sup>6</sup> When oil was first drilled, it was close to the surface, under high pressure and of good quality. Since then, the most profitable sources have been used up, leaving only the more difficult, expensive and lower quality sources. This is not restricted to crude oil, but includes natural gas, many minerals and substrates such as uranium.<sup>7,8</sup> The debate should centre on ‘when’ and ‘how quick the decline’, rather than ‘if’ for finite resources such as these.

This mismatch phenomenon can be illustrated by observing the trend of oil discovery and production for individual countries. In the UK, there has been significant publicity over the fact that North Sea gas output is now insufficient to meet domestic demand, resulting in a requirement to import gas from Asia.<sup>9</sup> A further example is the recent report that oil production in Kuwait has peaked.<sup>10</sup> Indeed, one of the protagonists in this field has recently illustrated the consecutive peaks in oil production experienced in a range of major oil-producing countries.

Although this peaking of resource production in some countries may be of local concern, it is only when global production peaks, or where there are trading difficulties, that economic consequences

are likely. Oil reserves will not suddenly ‘run out’, but are likely to decline gradually and irreversibly. From this point of peak production, prices will rise inexorably and quickly until demand is reduced or alternatives are found.

There are historical precedents for a mismatch of this magnitude. In 1973, following the Yom Kippur war, the first OPEC (Organization of the Petroleum Exporting Countries) production restriction of under 10% resulted in a greater than three-fold increase in the price of oil.<sup>11</sup> As a result of the oil price rise, there was a massive increase in government debt in both developed and poor countries (through the recycling of so-called ‘petrodollars’). This, combined with further oil production restrictions during the 1970s, resulted in massive de-industrialization in Europe as the competitive advantage of oil-importing countries vanished. Arguably, the current oil dependency is more significant, and the price rises are likely to be far higher than seen previously. The scale of this historical price rise was tempered by an increase in exploration and oil discovery which increased the supply of oil. This successful outcome has led to some complacent thinking about the likely impact of a peak oil scenario. The situation we face today is different for several reasons. Demand for oil is higher today than in the 1970s and is rising, existing oilfields have already peaked, and new supplies are expensive and require input of increasing amounts to extract from the ground. These factors alone will lead to continuing escalation in the oil price. However, many observers also argue that even when unconventional sources of oil, like Canadian oil shale, are taken into account, there is still no prospect that future output of oil can meet current or projected demands. This will lead to sustained price rises.

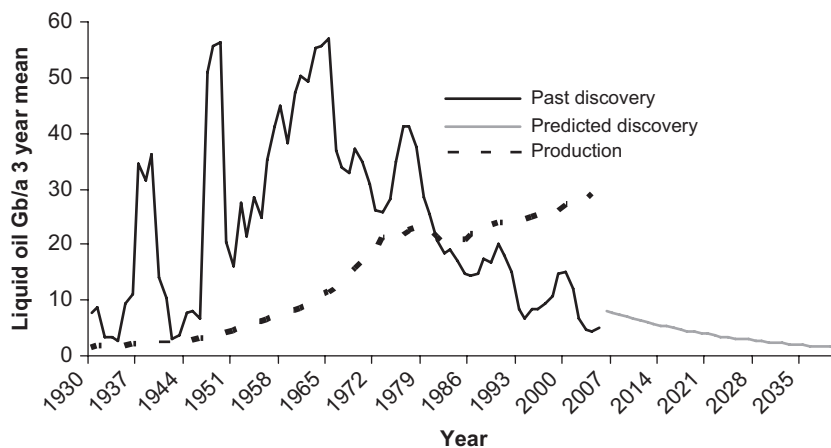


Figure 1 The growing gap between oil discovery and production.

The projected rapid rise in oil prices in the future will be driven not only by a supply shortfall, but also by continuing increases in demand.<sup>12</sup> This will occur because of economic development in countries like China and India, and also because of the dependence of the Western economies on motor vehicles, aviation and a supply of commodities, manufactures and food which come from China, India and other developing economies.

## Peak oil debate

The challenge of peak oil is not universally accepted in the scientific community or amongst policy makers.<sup>13</sup> Those proposing that we need not be overly concerned make a number of arguments. As oil prices rise, this incentivizes the development of alternative and more efficient sources of energy, and demand is reduced. Thus supply always meets demand and the market will allocate resources to cover unmet need. This is a serious objection and needs to be addressed.

It is true that the market will indeed make currently uneconomical alternative sources of energy more competitive as oil prices rise. Economic forces will also drive efficiencies. For example, the world's massive supplies of coal could be converted into oil. However, this is an energy intensive and therefore expensive activity. More importantly, were we to adopt this process, it would almost guarantee a catastrophic rise in greenhouse gases with accompanying climate chaos.<sup>14</sup>

All other alternatives simply generate electricity, which is useful for heating and limited forms of transport but is no substitute for the driving energy of the globalized economy, oil. There is no known alternative energy source that will provide a portable, cheap and concentrated source for motor cars and aviation. There are multitudes of problems to be overcome with other suggested alternatives such as nuclear, which would require conversion of its energy into another form for use in vehicles, and requires an ongoing supply of uranium which is another finite resource that is also subject to peaking. The much vaunted hydrogen economy is merely an energy medium rather than source, and it is an inefficient and expensive method for transport use.

Others seek to champion bio-fuels. Oil, gas and other fossil fuels were formed over a period of millions of years from crushed micro-organisms, and can essentially be thought of as concentrated solar energy stored in the earth's crust. As a result

of the extended period of time necessary to produce this resource, it can be thought of as a one-off and finite endowment. It is for this reason that bio-fuels will be unable to fill the energy gap, since they derive their energy from a single year of solar output and so could provide only a fraction of the energy contained within fossil fuels, even if bio-fuel farming covered all of the cultivatable land on the globe. There is already pressure on food production because of the shift to biofuels.<sup>15</sup>

It is clear that oil cannot be replaced as a cheap form of energy, but it is equally indispensable as the substrate for many industrial processes, most significantly fertilizers and plastics. There does not seem to be any obvious alternative raw material available for these needs.

Sceptics also make the point that, since as early as 1913, there have been a number of projections that oil production will peak, all of which have proved to be incorrect.<sup>16</sup> However, the evidence for an oil production peak is more robust now than in the past, as peak discovery is recognized to have occurred some 40 years ago. This is a crucial point, as previous 'scare stories' surrounding an oil production peak were never supported by evidence of an oil discovery peak. This evidence is now available and validates concerns surrounding a production peak.

The amount of oil ultimately recoverable from the earth is closely linked to the level of investment in drilling and refining technologies.<sup>17</sup> This variability inhibits accurate comparisons of future oil reserves, but even the oil industry has started to acknowledge the problem:

'The fact is, the world has been finding less oil than it's been using for 20 years now. Not only has demand been soaring, but the oil we've been finding is coming from places that are tough to reach. At the same time, more of this newly discovered oil is of the type that requires a greater investment to refine. And because demand for this precious resource will grow, according to some, by over 40% by 2025, fuelling the world's growing economic prosperity will take a lot more energy from every source' (Chevron advertisement in *The Economist* 1/10/05).

Therefore, there is evidence that a global peak in oil production is inevitable and imminent, and that economies around the world will go into recession if unprepared. What is in doubt is the timing and the rapidity of change. The permanence and scale of the scarcity in oil would be likely to have far more widespread effects than those seen during the 1970s, as the economies of most Western countries around the world have become orientated towards 'globalization'.

## A reversal of globalization

Globalization can mean many things such as a rapid transfer and sharing of information, cheap and reliable telecommunications across the globe, or trade and subspecialization of industry combined with massive international capital flows (global capitalism). Some of these are unlikely to be affected directly by oil scarcity (information flows and telecommunications), but the mechanisms of global capitalism and the associated continuous economic growth trend will be disrupted profoundly.

Significant oil price rises will reduce the feasibility of international trade for goods and services reliant on aviation, shipping and motor vehicles. Currently, the UK is a service-led economy which trades for the vast majority of its primary and manufactured goods including foodstuffs. The competitive advantage enjoyed by the UK which supports this will be reduced massively in a peak-oil-induced global depression. Thus, the economic fundamentals of the UK will be in jeopardy.

Looking more deeply, much economic and social development over the last 100 years has been based on the availability of cheap oil. This includes: the production of fertilizer which supports intensive farming techniques; the 'just-in-time' retail trade and its massive truck fleet; and the out-of-town shopping centres and suburbia developed without need for public transport. Almost every aspect of the society in which we live is currently dependent either directly or indirectly on the availability of cheap oil. It is worth mentioning that the USA is, arguably, in a far worse situation,

with cities such as Las Vegas built without contemplation of a post-cheap-oil world.

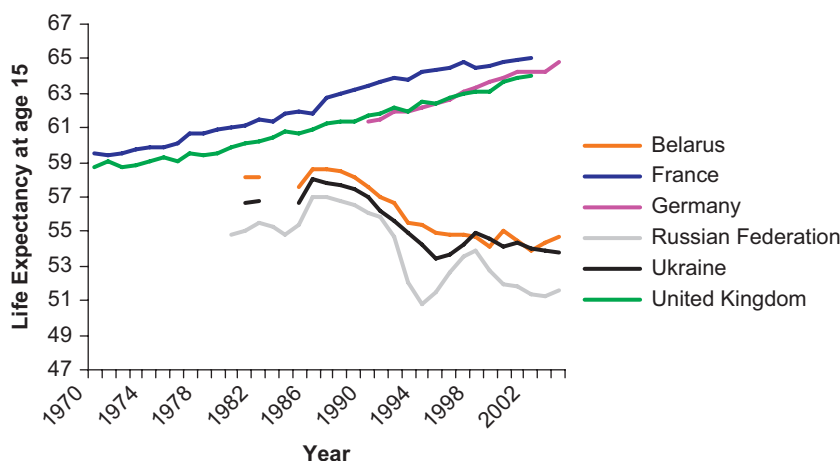
## Geopolitical implications

Perhaps the most concerning aspects of the peak oil phenomenon are the potential implications for international relations. There is a widespread belief that wars for oil resources are already underway, and this is prior to the production peak. Under a peak oil scenario, the competition for oil resources is likely to be even greater, particularly in oil-dependent countries such as the USA, UK and China. The impact that this may have for international relations (particularly with the Middle East) and the potential for war is not insignificant.

Even within countries, it is likely that the most vulnerable in any society will be most susceptible to the fall-out, as was illustrated in the aftermath of Hurricane Katrina in New Orleans. This, therefore, has the potential to widen inequalities in all spheres at a time when society will be least able to support those in greatest need.

## Economics and the creation of health

It is known that economic growth creates health, and recession destroys health. Historical data have shown that economic growth is the most important associated factor in determining health improvement.<sup>18,19</sup> There is also evidence that economic shocks destroy health, as was seen in the health trends of the population in the former Soviet



**Figure 2** The effect of economic recession on life expectancy. (Source: World Health Organization/Europe, European HFA Database, January 2006.)

Union<sup>20-22</sup> (Fig. 2) and with Scottish de-industrialization in the 1970s and 1980s.<sup>23</sup>

## Wealth inequalities

Moreover, it is known that both absolute and relative levels of income have a substantial impact on health. There is, however, a continuing debate over the extent and generalizability of these findings.<sup>24,25</sup> It can be concluded, however, that any reduction in absolute income levels will be detrimental to health, and any associated increase in income inequality will have an additional negative effect.

## Health in a society of plenty

There is a common pattern of health and illness in societies of plenty. Life expectancy is long, with low rates of serious infectious disease and improving survival from many previously fatal illnesses such as cancer. However, the burden of chronic disease continues to rise, measures of well-being are at best static,<sup>26</sup> and concerns are increasing about the prevalence of sexually transmitted infections, alcohol and drug abuse, obesity and mental illness. Public health is currently focused on these challenges, but there is a need to re-evaluate these priorities. Problems such as obesity and loss of well-being are, arguably, the product of a consumerist society built on cheap oil.<sup>27,28</sup>

## Health effects of peak oil

It is likely that the main health effects of peak oil will be driven by the consequences of an economic downturn. The effects of unemployment, de-industrialization, and absolute and relative poverty would be likely to mirror those seen in the former Soviet Union from 1989 and in industrialized areas of Europe from the late 1970s. The mechanisms of social and stress-induced illness are now recognized.<sup>29</sup> We could therefore reasonably expect a dip in life expectancy in the UK for the first time since the end of World War 1 if such an economic shock were to occur.

## Positive aspects of peak oil

The economic impact would only be one aspect of the forces acting upon human health in a peak oil scenario. The availability of individual motorized

transport is likely to be lessened, reducing the pressure on climate change after a substantial lag time. Pollution-driven respiratory illness, road traffic accidents and the obesity epidemic are all likely to be affected positively by the population increasingly beginning to cycle and walk.<sup>30</sup>

There will be an opportunity to move away from the profit-driven, stress-laden globalized system to which we have become accustomed, and this could impact on well-being through a range of intermediate factors such as changing work patterns or increased local community co-operation.

## Options for action

The essence of the problem of peak oil will be a lack of preparation for a future society in which oil will, at first, become increasingly expensive and then play only a marginal role. Although planning at individual and policy level could reduce negative effects, it is unlikely, given current trends, that market mechanisms alone will allocate resources in the interests of population health. The likely result is increasing inequality and geopolitical unrest.

At individual level, decisions could be taken to increase preparedness relating to employment, energy efficiency, lifestyle and transport. Industry could examine their reliance on oil-based products at all stages of their business, and carry out scenario planning to ensure their sustainability.

However, policy makers will have a crucial role in creating a sustainable society through the creation of pre-conditions to make these sustainable decisions possible. This would span areas such as energy and transport policy, town planning, and the wider structure of the economy. This is applicable at the level of the nation state, but also at international level through structures such as the European Union.

Although there is a rising tide of awareness about climate change, at present, there are no indications that even the most obvious impacts of peak oil have been considered in the UK, such as with air travel. There is therefore some way to go before there is general acceptance of the need to change policy direction, or of the actions required.

## Conclusions

There is now good evidence that an oil discovery peak occurred more than 40 years ago. It is, therefore, reasonable to expect an oil production peak to occur in the next few years. Although



government plans and market adaptations may mitigate the worst effects of this change, peak oil could eclipse all other determinants of health in the not-too-distant future. Health professionals are among the many groups that should address this threat urgently.

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### Competing interests

GMcC is a member of the Scottish Socialist Party.

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