

# The double scandal of insulin

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Before the discovery of insulin, children with type I diabetes needed to count calories, weigh their food, and sometimes fast or use ‘starvation diets’.<sup>1</sup> This situation changed in 1921 when work carried out by Frederick Banting and Charles Best at the University of Toronto led to the discovery, extraction and purification of insulin.<sup>2,3</sup> Leonard Thompson was given his first injection on 11 January 1922 in Canada, becoming the first person to be treated with insulin. Elliott Joslin, the first doctor in the USA to specialise in diabetes, spent most of his career seeing his patients with type I diabetes die due to a lack of an effective treatment. After this landmark event in 1922, he stated that ‘a new race of diabetics has come upon the scene’.<sup>4</sup> In addition Lawrence,<sup>1</sup> in his book *A Diabetic Life* (originally published in 1925), said: ‘Now modern discoveries, particularly insulin, have completely changed the outlook. There is no reason why a diabetic should not, if he can be taught to do so, lead a long normal life.’ More recently, in a report entitled *World Report on Knowledge for Better Health*, the World Health Organization stated: ‘From penicillin to insulin, antiseptics to anaesthetics and X-rays to magnetic resonance imaging, science has led to dramatic improvements in health world-wide.’ It also cites the work of Frederick Banting as one of the discoveries that has ‘revolutionised our approach to public health’.<sup>5</sup>

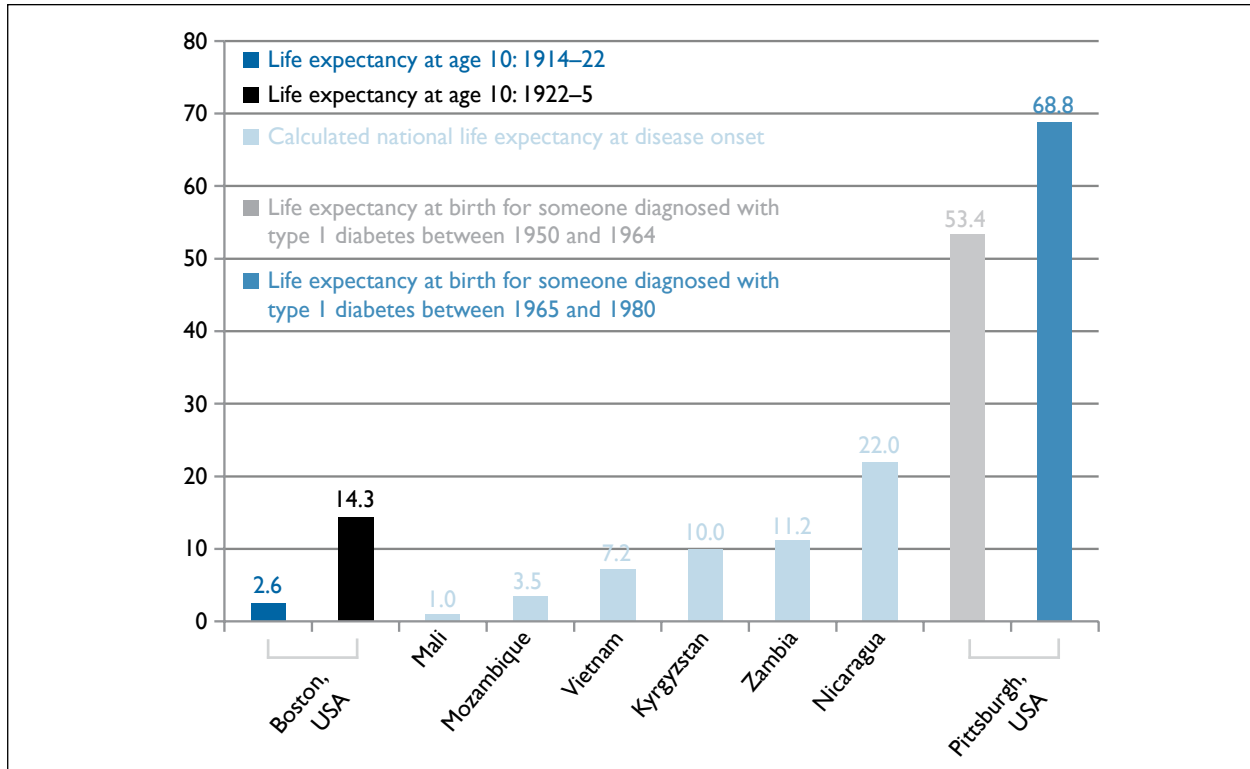
With the discovery of insulin in 1921 many thought that this would mean the end of the complications and suffering of those with type I diabetes. It went from being a death sentence to a disease that could be managed, so life-expectancy among children with this condition significantly increased.<sup>6,7</sup> But work by researchers in Kyrgyzstan, Mali, Mozambique, Nicaragua, Vietnam and Zambia<sup>8–15</sup> found that diabetes care needs more than just insulin; it requires many other tools and resources from the health system. Problems with access to syringes, diagnostic and monitoring tools, and a dearth of health facilities and healthcare workers with the capabilities to manage diabetes also impacted on outcomes for people with type I diabetes. Other problems in the health system and its infrastructure, government priorities and socio-economic factors also had an effect.<sup>16</sup> However, as stated by Gale,<sup>17</sup> the most common cause of mortality in children with diabetes is lack of access to insulin.

Data from the Democratic Republic of Congo show that one-sixth of people with type I diabetes die within five years of diagnosis.<sup>18</sup> Even more striking is the estimate that life expectancy for a child in rural Mozambique in 2003 is less than that of a child in Boston before the discovery of insulin (Figure 1).<sup>19</sup> Of course, other factors such as the overall health and socio-economic situation in countries like Mozambique have an impact, but lack of an appropriate diabetes response plays a major role.

Access to insulin and poor health outcomes are not just problems for low income countries. In the US, insulin discontinuation was the leading precipitating cause of diabetic ketoacidosis, and was responsible for 68% of admissions in a US inner city setting.<sup>20</sup> Among those who stopped taking insulin, 27% reported lack of money to buy it and 5% were making their insulin supplies last longer by taking smaller doses. The issue of access and affordability of insulin has also become a problem in Europe since the financial crisis, with Greece being but one example.<sup>21</sup>

At the same time, insulin sales in the USA for 2011 totalled US\$8.3 billion, a 14.9% increase compared with 2010.<sup>22</sup> This cannot be explained by the increase in prevalence and progressive nature of diabetes; two other facts contribute: Firstly the cost of insulin treatment is increasing, and secondly more people are being put on insulin. The inflation in costs is intimately linked to the (ab)use of analogue insulins (human insulin which is genetically altered to improve pharmacological properties such as speed of bioavailability), to a degree far in excess of National Institute for Health and Care Excellence (NICE) guidelines.<sup>23</sup> In 2000, 86.3% of insulin used in the UK was human and 10.7% analogue insulins. By 2008, however, the use of human insulin had fallen to 23.2%, with analogues representing 76.1% of the total.<sup>24</sup> Expenditure on analogue insulin represented 12% of total insulin cost in 2000 and 85% in 2010. The cost implications of this were major – from 2000 to 2010 the UK National Health Service spent £2,732 million on insulin.<sup>25</sup>

This phenomenon is happening not only in resource-rich settings, but also in countries like Kyrgyzstan, a landlocked Central Asian country with a gross domestic



**FIGURE 1** Comparison of life expectancies in low income countries<sup>8–10, 12–14</sup> today and Boston<sup>31</sup> and Pittsburgh, USA, historically.<sup>32</sup>

income of Int \$2,070 per capita, and Int \$140 spent on healthcare, per capita.<sup>26</sup> In Kyrgyzstan treating an individual with type 1 diabetes using analogue insulin was 8.5 times more expensive than treatment with human insulin. This cost the Ministry of Health US\$700,000 (equivalent to healthcare spending for 5,000 individuals) more than if they provided only human insulin.<sup>27</sup>

Most systematic reviews of analogue insulins find them to be of marginal advantage compared with human insulin, with most studies being open-label sponsor-funded comparisons. The long-acting analogues, in particular, which are those mainly used in people with type 2 diabetes, offer few benefits unless patients have been having symptomatic hypoglycaemia, particularly at night. Yet despite the limited evidence of the added value of analogue versus human insulin, this type of insulin has gained significant market share.<sup>28</sup>

In 2013 we are living in a world where resources are being wasted on products that show only small benefits, while people are not benefiting from a product that was first used some 90 years ago. With the increasing economic and health burdens of diabetes this should be an issue of concern to us all.

Why does this 'double scandal' exist? Firstly three multinational companies dominate the insulin market. This limits competition and a possible decrease in the price of insulin as there are no major producers to

stimulate generic competition. Next, prescribing practices are being influenced towards the use of analogue insulin. There is a disconnect between clinical practice, treatment guidelines and scientific evidence, especially in the area of type 2 diabetes, the main market for insulin. The market for insulin is influenced by doctors. As health is a derived demand, individuals with diabetes do not demand a particular type of insulin, they demand good health. That said, individuals with diabetes can be influenced both by their clinicians and by patient advocacy groups, with industry influencing all of these stakeholders. This situation was clearly seen in 2006 when the German Institute for Quality and Efficiency in Healthcare decided that the use of analogues in type 2 diabetes would no longer be reimbursed, resulting in outrage from the industry, clinicians and patient groups.<sup>29</sup>

The lesson we need to learn is that as a 'diabetes community', an alliance of patients and their carers, we have the responsibility to stand by government decisions that lead to proper use of scarce resources. This should be the case even if this means that certain products with marginal benefits but high costs are not made available or covered by insurance schemes. Of course, this should not harm the individual with diabetes. As individuals we want what is best for patients and ourselves now, but this short-term view is harming future generations of people with diabetes as well as those in less fortunate settings.

In parallel, we live in a globalised world. Clinical guidelines developed by the American Diabetes Association and other institutions influence and help improve diabetes care in the USA and other wealthy nations. But they also influence the practice in settings where resources are less plentiful. As academics and researchers we need to push for the best science and knowledge, which will lead to the best care for people with diabetes. We also must recognise that the gold standard for care in Edinburgh is not the same as in Mozambique. This is not to advocate 'poor medicine for poor people', but more a call to adapt solutions to the local context.

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