

The ethical and practical considerations of using vaccination history as a rating factor in life insurance underwriting

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ABSTRACT

Vaccinations are accessible, affordable, and highly effective, but vaccination coverage is lower than it should be, and hundreds of thousands of adults, who constitute the majority of the insured population, are still dying every year of vaccine-preventable diseases. In addition to the human toll, there are huge financial costs associated with treating affected patients.

This paper explores the ethical and practical considerations of using vaccination history as a rating factor for life insurance products which pay out on mortality or morbidity events. Insurers offering these products have an interest not only in accurate pricing and assumption of risk, but also in minimising the significant mortality and morbidity implications of these diseases.

The reader is asked to consider whether it is incumbent upon the insurance industry, not only for financial, but also for ethical reasons, to encourage vaccination by charging premiums which adequately reflect the additional risks posed by adults who choose not to get vaccinated, or to implement other exclusionary measures where applicable. The ethical implications are broader than just fairness towards vaccinated policyholders who may currently be cross-subsidising their unvaccinated counterparts. Successful vaccination programmes, which are defined by a high uptake level, protect the whole population by helping to achieve herd immunity.

While it is not expected that vaccination history as a rating factor will take on the statistical

significance of age, sex or smoking in premium discrimination, the financial and social benefits of encouraging better vaccination behaviour may very well outweigh the costs of introducing it into life insurance underwriting. And, if so, do the insurance industry and actuarial profession not have an ethical duty to play their part in the prevention of unnecessary disease and the improvement of quality of life?

It is hoped that the ideas introduced and conclusions drawn in this paper will spark discussion on this topic. The paper is not intended as a technical work but rather as a thought experiment, combining ethics, healthcare, politics, culture, actuarial science and medical science.

Recent events have shone a spotlight on the issue of vaccination, which makes now an opportune time start the conversation. On the one hand, the world desperately awaits a Covid-19 vaccine. On the other, there is a vocal and growing anti-vax movement based largely on “fake news”, which has led to the resurgence of diseases once assumed to be virtually eradicated. These two opposing forces raise many interesting points to be discussed, including the ethics of mandatory vaccination, the financial burden of infectious diseases, and the role the insurance industry has to play in their containment.

The topics in this paper have been examined in a South African context where possible. While incidence of disease, attitudes towards vaccination and resources available may differ between countries, the insurance and ethical concepts considered are universal.

KEYWORDS

Vaccination, ethics, underwriting, life insurance

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If not us, who? If not now, when?
(Paraphrased from Hillel the Elder)

1. INTRODUCTION

1.1 In the 8 April 1899 edition of *The British Medical Journal*, an article entitled “LIFE INSURANCE AND VACCINATION” set out the results of an inquiry into the practice of life insurance offices regarding proposals for the insurance of unvaccinated lives (*The British Medical Journal*, 1899: 869). The authors recognised that:

If vaccination is to be grossly neglected..., sooner or later the price in the shape of small-pox attacks and small-pox deaths will have to be paid, and life insurance societies and sick clubs will suffer in proportion to the want of vaccination and revaccination in their membership, whilst the vaccinated members will have to pay the money penalties involved in diminution of funds and bonuses.

1.2 In other words, the mortality impact of the public not getting vaccinated against smallpox would be material enough to affect insurers' claims experience and, consequently, future benefit payments to their members. The 69 respondents to the inquiry were grouped into eight classes based on their underwriting treatment of unvaccinated lives, as set out in Table 1 below.

TABLE 1 Treatment of unvaccinated lives by surveyed British life insurance Offices

Class	Underwriting treatment	Number of offices
I	Proposals from unvaccinated persons not accepted	13
II	Death from smallpox of unvaccinated persons excluded from contract	11
III	Premiums alone or surrender value alone paid on death from smallpox of unvaccinated persons	5
IV	Extra premiums charged to unvaccinated persons	19
V	Years added to the age of unvaccinated persons	8
VI	Proposals from unvaccinated persons discouraged	1
VII	Proposals from unvaccinated persons dealt with on their individual merits	5
VIII	No difference made between vaccinated and unvaccinated persons	7

1.3 When one considers that the words “unvaccinated” and “smallpox” in the table above might be replaced by “smoking” and “lung cancer” in the 1980s (Marais, forthcoming: 19) or “HIV-positive” and “AIDS-related illnesses” in the 1990s (Daniels, 1990), it becomes clear that, in some ways, little has changed in the field of life insurance underwriting over the last 120 years.

1.4 Unlike other risk factors, however, which, in South Africa at least, have either become established rating factors (in the case of smoking), or treated similarly to other chronic illnesses (in the case of HIV and AIDS (Henly & Zimmerman, unpublished)), the use of vaccination history seems to have disappeared from the underwriting consciousness. How can this be considered appropriate when more than 1,5 million people are dying globally—and many more seeking medical treatment—as a result of vaccine-preventable diseases (VPDs) each year (WHO, unpublished)?

1.5 Perhaps it is assumed that the vast majority of the insured population is vaccinated as a product of childhood vaccination programmes, and therefore the proportion at risk of contracting and seeking treatment for a VPD is negligible. But such an assumption holds no ground: vaccination coverage in adults is lower than may be expected, and this results in substantial human and economic costs each year (Toumi & Ricciardi, 2015). One possible explanation for this is the perception that vaccination after childhood is unnecessary, and this, in turn, may be due to the enduring focus of vaccination programmes and education on children (and even with these programmes in place, childhood vaccination coverage is not meeting its targets (Burnett et al., 2019)). This thinking, however, ignores the following

facts: (1) new vaccines have been developed since most people were children; (2) many childhood vaccinations require boosters in adulthood; and (3) the major burden of VPDs lies with adults, rather than children. In the US alone, between 50 000 and 70 000 adults die of VPDs each year, versus 1 000 to 3 000 children—an imbalance that demonstrates the need for continuity of vaccination into mid-life and older age (Thomas-Crusells et al., 2012).

1.6 In addition to the direct impacts of the diseases themselves, VPDs also have various non-specific effects on morbidity and mortality. Influenza in adults, for example, significantly increases the risk of cardiac and cerebrovascular disease in adults of all ages (Doherty et al., 2019).

1.7 Vaccination is one of the most effective healthcare interventions in history (CDC, 1999), and improved vaccination coverage can potentially deliver significant decreases in healthcare utilisation (in addition to improved quality of adult lives). At the same time, more detailed tracking of the burden of disease and more sophisticated health economic analyses suggest that the benefit of vaccination may in fact be generally under-estimated (*ibid.*). Despite this, the current view of many members of the public is, however, that vaccination is unnecessary at best, and dangerous at worst.

1.8 Is it not then incumbent upon the insurance industry, not only for financial, but also for ethical reasons, to encourage vaccination by charging premiums which adequately reflect the additional risks posed by adults who choose not to get vaccinated? Or to implement other exclusionary measures where applicable? The ethical implications are broader than just fairness towards vaccinated policyholders who may currently be cross-subsidising their unvaccinated counterparts. Successful vaccination programmes, which are defined by a high uptake level, protect the whole population by helping to achieve herd immunity (Fine et al., 2011).

1.9 The force behind the established and prominent insurance sector—which constituted almost six percent of the JSE All Share Index in 2015 (Alagidede & Mangenge, 2016: 905)—may be strong enough to effect a real societal change, shifting attitudes towards adult vaccination and even bolstering herd immunity in the long term. Is it not the industry's and the actuarial profession's ethical duty to harness this power and encourage positive behaviour?

1.10. Of course, there are practical, ethical and political factors to consider before implementing a new rating factor. Changing underwriting systems, pricing models and processes is an expensive and complex undertaking. Vaccination is not mandatory in South Africa, and there is an ethical question as to whether it should be (Giubilini et al., 2018). The anti-vaccination, or anti-vax, movement, which gained traction in the 1990s, shows evidence of growing (Smith, unpublished)—as does antibiotic resistance (Mishra et al., 2012), which makes better vaccination education and coverage all the more urgent. And, with these set

pieces as a backdrop, 2020 ushered in the devastating Covid-19 pandemic, which, in itself, has shone a spotlight on the criticality of effective vaccination to all facets of society.

1.11. This paper is not intended as a technical work. Its focus is not on the accurate modelling of the impact of VPDs on mortality, morbidity and the insurance industry. Nor is it an exhaustive examination of the ethical considerations of mandatory vaccination or the use thereof as a rating factor. It is hoped, rather, that the ideas presented will start, or, with reference to the aforementioned *British Medical Journal* article, revive, the discussion on the link between vaccination and life insurance—in South Africa and elsewhere.

1.12. It is said that history does not repeat itself, but it rhymes. Perhaps, as far as underwriting is concerned, Covid-19 will be the smallpox of our times.

2. BACKGROUND: A BRIEF HISTORY OF VACCINATION AND ITS VALUE IN SOUTH AFRICA TODAY

2.1 Vaccines have been hailed as one of the greatest ever achievements of biomedical science and public health (CDC, 1999). Although the practice of vaccination as routine for large populations—which led to the virtual elimination of risks posed by major VPDs in the developed world (CDC, 2011)—only flourished in the twentieth century, attempts to “vaccinate” began long before that (Plotkin & Plotkin, 2018: 1).

2.2 Immunisation is defined as “the process of protecting individuals from disease by making them immune. This is most often accomplished *actively* through vaccination, the delivery of *antigens* (substances on the microbe that are foreign to the host, contained in vaccines) for purposes of stimulating an immune response. It can also be accomplished *passively* by the administration of antibodies.” (Marshall, 2012: 13) (emphasis in original). Marshall goes on to say that, while not always technically correct, the terms ‘vaccination’ and ‘immunisation’ are often used interchangeably. The use of the term ‘vaccination’ in this paper refers strictly to active immunisation.

2.3 Edward Jenner, a doctor from Gloucestershire, first achieved active immunisation, or vaccination, by actively administering a smallpox vaccine to a boy named James Phipps on 14 May 1796. By 1801, about 100 000 people in Europe had been vaccinated (Allen, 2007: 50) and by 1980, the World Health Organisation declared that smallpox had been eradicated globally (Fenner et al., 1988: 540). Although Jenner is probably the name most commonly associated with the development of vaccines (Allen, 2007: 46), there is evidence that forms of smallpox vaccination had been practised in China since the 1600s (Plotkin & Plotkin 2018, p.1).

2.4 By the end of the first decade of the 21st century, vaccines had been developed for 27 dangerous and deadly diseases. These are listed in Table 2 below.

TABLE 2 Vaccine-preventable diseases, by year of vaccine development or licensure in the United States (CDC, 1999 and CDC, unpublished a)

Vaccine	Year of development/licensure
Adenovirus	1980
Anthrax	1970
Cholera	1896
Diphtheria*	1923
Hepatitis A	1995
Hepatitis B*	1981
Haemophilus influenzae type b (Hib)*	1945
Human papillomavirus (HPV)**	2006
Seasonal influenza (Flu)	1946 (redeveloped each year based on seasonal strains)
Japanese encephalitis	1992
Lyme disease (no longer available)	1998
Measles*	1963
Meningococcal (meningitis)	1975
Mumps	1967
Pertussis (whooping cough)*	1926
Pneumococcal (pneumonia)*	1977
Poliomyelitis (polio)*	1955
Rabies	1885
Rotavirus*	1998
Rubella	1969
Shingles	2006
Smallpox	1798
Tetanus*	1927
Tuberculosis*	1927
Typhoid fever	1896
Varicella (chicken pox)	1995
Yellow Fever	1953
*Available free at state clinics in South Africa for all children as part of the South African Department of Health's Expanded Programme on Immunisation in South Africa (EPI-SA) (Provincial EPI Team et al., 2010)	
**Available free at schools in South Africa for all nine-year-old girls as part of the EPI-SA and the Integrated School Health Programme (ISHP) (National EPI Team et al., 2015: 29)	

2.5 In 2020 South Africa, the government provides 11 of these vaccines to children at no cost at state clinics and schools (Provincial EPI Team et al, 2010; National EPI Team et al.,

2015: 29), making vaccination affordable and accessible to a largely low-income population. In fact, since 2009, South Africa has been the first country in sub-Saharan Africa to include the rotavirus vaccine (effective in preventing severe diarrhoea, which is one of the top causes of deaths in African children younger than five) in routine child immunisations (Madhi et al., 2010: 289), reiterating the value the state recognises in wide-spread vaccination.

2.6 The generosity of the state in this regard may also be for social reasons. In South Africa, where the spirit of ‘ubuntu’ is an important element of the common good, infectious diseases take on social significance because their ability to spread often depends on social interactions (Cheyette, 2011: 679). Desmond Tutu (1999: 31) described ubuntu as speaking to a sense of shared humanity, a belief that “[a] person is a person through other persons. It is not ‘I think therefore I am.’ It says rather: ‘I am human because I belong. I participate. I share.’” In a society that cherishes togetherness and so embraces the norm of ubuntu that the term has been referenced in a decision made by the Constitutional Court, the highest court in the land,¹ it may be inferred that the practice of vaccination, which benefits not only the patient, but also health-care workers, other patients, vulnerable individuals and the community at large, would be highly valued.

2.7 Large-scale administration of vaccines has not only saved countless lives over the past century, but it has also led to a substantial decline in hospitalisation and health-care costs associated with VPDs (CDC, 2011). The potential cumulative economic devastation that could be caused by these diseases is staggering, based on the observed financial impact of Covid-19 during the first half of 2020. Covid-19 is a novel virus for which a vaccine, at the time of writing, has not yet been found. In his Supplementary Budget Speech on 24 June 2020, the South African Minister of Finance, Tito Mboweni, announced an expected 5.4% contraction of the global economy for the year, with the South African economy expected to contract by 7.2%—the largest contraction in nearly 90 years.² So, vaccines reduce not only direct health-care costs, but also the indirect cost of disease which has far-reaching effects on the economy as a whole.

2.8 In an ideal world, the importance of vaccination would reduce over time as diseases would be eradicated one by one. The opposite, however, is likely to be true. Vaccination will become increasingly crucial to global public health as antibiotic resistance continues to rise exponentially and the rate of discovery of new antibacterials declines (Mishra et al., 2012: 5). Vaccines are a key component in the fight against antibiotic resistance both directly and indirectly. By targeting bacterial pathogens, vaccines directly reduce the need for the use of antibiotics: a case of prevention being better than no cure when antibiotics are no

1 *Port Elizabeth Municipality v. Various Occupiers*, 2004 (53). South Africa, Constitutional Court

2 Mboweni, T. South African Parliament. 24 June 2020, <https://www.gov.za/speeches/minister-tito-mboweni-2020-supplementary-budget-speech-24-jun-2020-0000>, 5/7/2020

longer effective. Even vaccines created against non-bacterial pathogens can have an indirect effect on pathogenic bacteria by reducing complications associated with superinfections that routinely require antibiotic use. Vaccines also contribute to the reduction of antibiotic usage through the establishment of herd immunity, shielding vulnerable individuals and therefore limiting the numbers of infections in the overall population (Mishra et al., 2012: 2).

2.9 Vaccination offers enormous health, economic and social benefits in its ability to prevent infectious diseases, and, given the current global scramble to find a Covid-19 vaccine (as at April 2020 there were over 150 development projects worldwide, according to McCaffrey (unpublished)) and the rise of antibiotic resistance, the practice is set to become only more valuable in future. It may come as a surprise, therefore, that the concept and practice of vaccination are not universally accepted or embraced. The reasons for this include the elements of any modern scandal: cognitive biases, fake news, and Hollywood.

3. REASONS FOR LOW VACCINATION COVERAGE IN ADULTS AND VACCINATION AS AN ETHICAL QUESTION

3.1 Unless they consciously decide to get vaccinated as adults, children whose parents do not vaccinate them tend to become adults who are not vaccinated. Many factors have been cited as reasons for low vaccination coverage in children and adults. These include: the speculative link of vaccination to autism and other conditions; lack of education; societal norms; moral or religious convictions, etc. (Dubé et al., 2013). This section outlines some of the leading explanations for vaccine-hesitancy (defined as a planned delay in, or refusal of, vaccination) and why vaccination—or the refusal thereof—is an ethical question.

3.2 Vaccination controversy: Fear, fraud and the anti-vax movement

3.2.1 Before the 21st century, vaccination programmes were commonly recognised as one of the most cost-effective public health interventions available and the arrival of new vaccines was almost always welcomed by public health decision-makers and clinicians. Interestingly, however, the increase in the number of vaccines has resulted in an increase in individuals' negative perception of the relevance of particular vaccines or vaccine schedules (Dubé et al., 2013: 1766).

3.2.2 In 1998, Dr Andrew Wakefield, a British gastroenterologist, published a paper which would trigger what could be the most damaging medical hoax of the last 100 years (Flaherty, 2011). The paper described a new autism phenotype triggered by environmental factors such as measles, mumps, and rubella (MMR) vaccination. The alleged vaccination-autism connection decreased parental confidence in public health vaccination programmes and created a public health crisis in England and questions about vaccine safety in North America. The latter was no doubt fuelled by a handful of vocal Hollywood celebrities' support of the paper. Perhaps the most prominent of the anti-vaccination, or anti-vax, voices is actress Jenny McCarthy, who, in 2007, embarked on a high-profile media tour to spread awareness about autism—and her claim that vaccinations may be linked to

the disorder. In the same year she published her New York Times bestselling book, *Louder Than Words: A Mother's Journey in Healing Autism*, in which she claimed that her son Evan, developed autism after getting the MMR vaccination (McAfee, unpublished).

3.2.3 After 10 years of controversy and investigation, Dr Wakefield was found guilty of ethical, medical, and scientific misconduct in the publication of the autism paper. Additional studies showed that the data presented were fraudulent (Flaherty, 2011). But the anti-vax movement had already taken root and parental fear of vaccination still remains. This fear is evidenced by the increasing number of pockets of under-vaccination in Western societies, and the surge of measles outbreaks in the Western world (Pierik, 2018: 381). The Wakefield scandal is perhaps the most famous vaccination controversy, but it is by no means the only one—a similar unsubstantiated association between the hepatitis B vaccine and multiple sclerosis in France resulted in the suspension of the universal vaccination programme in the 1990s (Dubé et al., 2013: 1765).

3.3 The omission bias: Risk and regret

3.3.1 A psychological factor which may explain vaccine-hesitancy not only in parents responsible for their children's health, but also in adults regarding their own vaccination behaviour (e.g. getting an annual flu vaccine) is the perception of risk in decision-making and the influence of the omission bias.

3.3.2 The omission bias purports that individuals are more averse to the risks associated with an action—in this case getting what they perceive as an unsafe vaccine—than to the risks associated with inaction—taking a chance of contracting a VPD (Dubé et al., 2013: 1769). This bias is further entrenched by the fact that vaccines are administered as prophylactics to healthy individuals and the risks of vaccines (real or speculative) are visible, while their benefits are, by definition, impossible to evaluate at an individual level. In addition, the decision not to vaccinate is reversible, while the opposite is not true. One of the most famous parents to succumb to omission bias was American Founding Father, Benjamin Franklin, who wrote of his son's death of smallpox (Franklin, 1950: 113):

In 1736 I lost one of my sons, a fine boy of four years old, by the smallpox taken in the common way. I long regretted bitterly and still regret that I had not given it to him by inoculation. This I mention for the sake of the parents who omit that operation, on the supposition that they should never forgive themselves if a child died under it; my example showing that the regret may be the same either way, and that, therefore, the safer should be chosen.

3.4 Public health priorities: Lack of awareness and resources

3.4.1 As strong as the influence of cognitive biases, Hollywood and socio-cultural norms may be, that of education, funding and resources—or the lack thereof—may be even stronger.

3.4.2 Vaccination has been one of the major drivers of a global ageing population by reducing deaths from complications of coexisting chronic conditions and directly

from infectious disease. Most vaccination programmes, however, are focused on reducing mortality and morbidity in children, even though the major burden of VPDs is in adults (Doherty et al., 2019). This is the case in the US, Europe and the UK, as well as locally.

3.4.3 In South Africa, although many childhood vaccinations are free, vaccination is not mandated by law, and the take-up rate is well below target. The World Health Organisation (WHO) Global Vaccine Action Plan (GVAP) 2011–2020, set a 2020 global target for countries to reach 90% national coverage of all their primary series vaccines. Latest available data show that South Africa has not reached this level. Furthermore, EPI-SA has consistently reported much higher administrative vaccination coverage than the WHO and United Nations Children’s Fund Estimates (UNICEF) of National Immunisation Coverage (WUENIC). This casts uncertainty on the true vaccination picture in South Africa. In March 2019, the South African National Department of Health launched South Africa’s first national household vaccination coverage survey to build a clearer view of vaccination data (Burnett et al., 2019: 1). The results of the survey were not yet available at the time of writing.

3.4.4 If childhood vaccination coverage, which is driven by substantial education and financial resources, is below what it should be, then it comes as no surprise that vaccination coverage in adults—who constitute the vast majority of the insured population—is even lower (Cohn et al., 2018).

3.4.5 The focus on childhood vaccination appears to have been partly shaped in the early years of many national vaccination programmes, when demographics were skewed towards younger populations. Perceptions of cost-effectiveness might also have contributed, as infants and children are easier to reach through primary healthcare contacts. This focus on childhood vaccination has left the problematic impression in many minds that vaccination is an activity only relevant to children, and it has left many adults ignorant of the fact that booster vaccinations may sometimes be necessary. This bias may partly explain why adult vaccination coverage is almost always lower (and often much lower) than paediatric vaccination coverage in the same country, even for diseases where adult vaccination is recommended and fully reimbursed (Sheikh et al., 2018). In Africa, adult vaccination has mostly focused on pregnant women for whom vaccines are delivered at ante-natal clinics during routine visits. Aside from that, most adults remain unvaccinated despite the vaccines being available (Haddison et al., 2019), and recommended adult vaccine schedules and information being maintained by organisations like the CDC (unpublished b) and National Institute for Communicable Diseases (NICD).

3.4.6 Ultimately, low vaccination coverage in adults reflects the fact that adult vaccination has not been a public health priority for decades in the way that paediatric vaccination has been. As Doherty et al. (2019) conclude:

[V]accine coverage remains poor in many countries where access to healthcare and vaccination are free at point of care, and vaccination is recommended: this implies that not all barriers to vaccination are not economic or medical, but instead may be psychological and/or educational.

3.4.7 Many people are not aware of the recommendations for adult vaccination or may not realise the importance thereof. The *American Journal of Managed Care* (2019) lists factors such as lack of information, vaccine hesitancy, and lack of accessibility as barriers that may interfere with vaccination rates. Misinformation about vaccine safety can lead to more unvaccinated individuals, thereby increasing the risk of outbreaks of VPDs.

3.4.8 Doherty et al. (2019) emphasise that one of the groups most vulnerable to VPDs and VPD outbreaks is older people. In addition to the structural barriers to adult vaccination such as awareness, availability, access and cost, there is the perception in both the medical profession and the public at large that the death or ill health of older people attributable to infectious disease is to a certain extent ‘inevitable’. “The death of an older person from pneumococcal disease, for example, may be considered unfortunate, while death from the same illness in a child is often described as a tragedy”.

3.4.9 This is concerning, given that overall rates of hospitalisation for Community-Acquired Pneumonia (CAP) are increasing as the population ages, even though many cases of CAP are potentially vaccine-preventable. Even in European countries, the UK and the US, where adult vaccination has been well-resourced and recommendations, infrastructure and funding are in place to broadly support adult vaccination, paediatric pneumococcal vaccination coverage is much higher than that of adults (ibid.).

3.4.10. In other countries, the low coverage levels in adults are a reflection of the low funding (and thus, presumably, priority) given to vaccination in general and adult vaccination in particular. If vaccination of adults is to gain an increased share of healthcare resources, in an era where health budgets are generally under pressure, it will need increased support. For this to happen, both the general population and healthcare professionals need to understand the benefits of vaccination and accept the concept of vaccination as a preventive measure akin to exercise, healthy diet or medical risk reduction. Currently, a substantial proportion of the resources lost from illness and treatment of VPDs in older adults could be prevented by vaccination, resulting in a considerable cost saving. This argument becomes more compelling if one considers that the benefits of vaccination also improve overall health and quality of life. These benefits can be expected to affect more than just the vaccinated person: improved quality of life in older adults will presumably also benefit the families and households who depend on them or upon whom they depend. Extended healthy lifespans are also likely to provide broader economic benefits than just reduced medical costs, as healthy older people are more likely to remain engaged in the workplace and social activities (ibid.).

3.4.11. The insurance industry, either directly through including vaccination in history in its underwriting processes, or indirectly through corporate social investment into vaccination education, has the potential to play an important role in this movement towards higher adult vaccination coverage.

3.5 How a medical lifesaver became an ethical question

3.5.1 To be successful in reducing the prevalence and incidence of VPDs, vaccination programmes rely on a high uptake level. In addition to direct protection for vaccinated

individuals, high vaccination coverage rates induce indirect protection for the overall community, or herd immunity, by slowing transmission of the diseases, thereby decreasing the risk of infection among those who remain susceptible in the community (Fine et al., 2011). And so, the question of vaccination becomes an ethical one: should the individual's freedom of choice to vaccinate or not be over-ridden for the sake of the common good? The pertinence of this question is reflected in the World Health Organisation declaring vaccine hesitancy as one of the top ten threats to global health in 2019 (WHO, 2019b).

3.5.2 A substantial body of literature, beyond the scope of this paper, with foundations in bioethics and other ethical structures, exists to explore whether childhood vaccination should be mandated by law. Pierik (2018) argues that “childhood vaccinations should not be seen as part of the domain of parental choice, but as a nonnegotiable [*sic*] legal obligation, on a par with car seats, seat belts and compulsory education.” But policies that mandate vaccination have always been controversial and there seems to be an increasing trend of opposition toward mandatory vaccination: more than 10% of American parents are opposed to compulsory vaccination. Not surprisingly, parents who disapproved of compulsory vaccination were significantly more likely to hold negative beliefs regarding the safety of vaccines and their utility to protect their child's health (Lantos et al., 2010).

4. IMPACT OF VACCINE-PREVENTABLE DISEASES ON MORTALITY AND MORBIDITY OF THE INSURED ADULT POPULATION IN SOUTH AFRICA

4.1 It is known that VPDs such as tuberculosis, lower respiratory tract infections and diarrhoeal diseases are among the leading causes of death in South Africa and account for a large proportion of healthcare expenditure (Boyles et al., 2019). To consider the viability of using vaccination history as a rating factor in life insurance underwriting, however, a quantifiable estimate needs to be formed of the number of adults being hospitalised and dying each year of VPDs. If assumptions are made regarding how many of those adults are policyholders or beneficiaries, and the average associated cost to the insurance industry for each death and medical treatment, the burden of non-vaccination on the industry may begin to be quantified.

4.2 The values put forward in this section are not exact and are based on very simplified assumptions. The analysis is therefore not intended for use in its current form by any insurance company looking to assess the financial impacts of non-vaccination. It is hoped, rather, that it may provide a starting point for discussion, demonstrating the potential scale of the issue in question.

4.3 Estimated mortality cost

4.3.1 Table 3 sets out the assumed number of adult deaths per disease in South Africa, the assumed efficacy of each vaccine, and hence the estimated number of preventable deaths due to the deadliest VPDs. For simplicity, only the VPDs with the highest number of recorded deaths have been included, and hence ‘deadliest’ here refers to the number of deaths reported in South Africa based on available data, not to the virulence of the disease. It

has been assumed that none of the deceased lives had been vaccinated, hence the number of preventable deaths is calculated by multiplying the number of deaths by the assumed vaccine efficacy.

TABLE 3 Estimated annual number of adult deaths in South Africa as a result of the deadliest VPDs

Disease	No. adult (aged 15+) deaths rounded to the nearest 100	Assumed vaccine efficacy	Estimated no. preventable deaths	Comments
Tuberculosis	63 000 (WHO, 2019 a)	50% (Hussey, 2007)	31 500	Tuberculosis is the number 1 cause of natural deaths in SA, accounting for 6.4% (Stats SA, 2017). Studies have shown variable vaccination efficacy, especially in populations with HIV prevalence. 50% is an average estimate.
Pneumonia	16 400 (Stats SA, 2017)	60% (CDC, unpublished c)	9 840	Pneumonia is the number 7 cause of natural deaths in SA, accounting for 4.2% (Stats SA, 2017). The Stats SA report groups Influenza and Pneumonia together, but further in the report it seems that in the majority of these cases the cause of death is pneumonia. Influenza has therefore been split out into its own row. The CDC estimates vaccine efficacy of 60%–70%, which may be reduced for immunocompromised people, hence the lower estimate has been used.
Influenza	8 500	50%	4 250	The NICD estimates 6 000–11 000 deaths annually (NICD, unpublished). The average has been assumed here. The CDC estimates vaccine efficacy of 40%–60% (CDC, unpublished d). The average has been assumed here.
Viral hepatitis	400 (Stats SA, 2017)	90%	360	It has been assumed that all cases are hepatitis B, which is more virulent than hepatitis A and endemic to South Africa. The CDC estimates vaccine efficacy of 80%–100% (CDC, unpublished e). The average has been assumed here.

continued overleaf

Cervical cancer (caused by HPV)	5 600 (HPV Information Centre, 2019)	90% (Cutts et al., 2007)	5 040	Cervical cancer causes the highest number of female cancer deaths in South Africa, with almost a 50% mortality rate (HPV Information Centre, 2019). Data are not yet available on the safety and efficacy of HPV vaccines in Africa, nor in populations with high HIV prevalence. Furthermore, HPV vaccines are designed to be prophylactic (i.e. to prevent infection and consequent disease) and data on efficacy are limited for women already exposed to vaccine-type HPV. For these reasons, the efficacy rate quoted here may be overstated.
Oropharyngeal cancer (caused by HPV)	300 (HPV Information Centre, 2019)	90%	270	Above comment on efficacy applies.
Total	94 194		51 260	

4.3.2 The Association for Savings and Investment South Africa (ASISA), as part of their 2018 insurance gap measurement in partnership with True South Actuaries & Consultants, determined that the average South African earner had life cover of R0,6 million (ASISA, unpublished).

4.3.3 According to these crude estimates, over 50 000 lives might be saved by vaccination in a given year. Based on the ASISA assumption, these deaths would cost the South African insurance industry more than R30 billion.

4.4 Estimated morbidity cost

4.4.1 Products such as lump sum disability and dread disease or critical illness cover also fall under the umbrella of underwritten life insurance. The morbidity risk and costs associated with VPDs would therefore, alongside mortality risk, be an important metric for insurance companies considering the inclusion of vaccination history as a rating factor. Due to the availability of data regarding vaccination in the United States, a good starting point to estimate VPD-related morbidity costs may be to consider the annual costs incurred due to VPDs there, which may then be translated to the South African situation.

4.4.2 It is estimated that the US spends \$27 billion annually treating adults for diseases that could have been prevented (Vaccinate your family, unpublished). If that figure is scaled down by a factor of 5,6 to account for the smaller population in South Africa,³ it may be assumed that close to \$5 billion (around R85 billion based on a ZAR:USD exchange

³ Based on an assumed US population of 331 million and a South African population of 59 million as per <https://www.worldometers.info/world-population/population-by-country/>

rate of 17:1) is spent locally. Of course, adjustments would need to be made for factors like the relative differences in healthcare costs, the diseases within that may not be vaccine-preventable in South Africa, and the proportion of the population that is insured, but even a small fraction of that estimate is a significant number.

4.4.3 To reiterate the scale of the cost of infectious diseases, it is worth noting that some models estimate that vaccinations administered to children born in the United States from 1994 to 2013 will result in a net savings of \$295 billion in direct costs and \$1,38 trillion in total societal costs (*American Journal for Managed Care*, 2017). Measles alone, which was declared to be eradicated by the United States in 2000 but is seeing a resurgence in certain pockets of the population due to the anti-vax movement, costs \$140 000 per case to contain (*ibid.*).

5. CONSIDERATIONS OF USING VACCINATION HISTORY AS A RATING FACTOR

5.1 Current underwriting practice in a South African context

5.1.1 Marais (forthcoming: 15) sets out common South African life insurance underwriting practice, where ‘underwriting’ refers to the process by which the insurer decides whether or not to accept a proposal of insurance, on what conditions, in what proportion, and at what price (Diacon & Carter, 1998). The process relies on information from the application form and medical reports to determine the most appropriate premium rate to charge the applicant. Underwriting ensures both the financial survival of the insurance industry and fairness amongst policyholders by charging similar rates for similar risks.

5.1.2 For fully underwritten products (where all the risk factors are carefully considered in determining the premium rate), one may distinguish between the general underwriting process (i.e. the allocation of each insured life into a specific risk group) and the individual underwriting process (i.e. the assessment of any additional individual risk, after the allocation to a specific risk group). The general underwriting process would determine the standard rate for the applicant and the information gathered from the individual underwriting process would typically determine whether the applicant would be accepted at the standard rate, accepted with a premium loading, or declined. The commonly used general underwriting criteria in South Africa are age, sex, smoking status and socio-economic class. The individual underwriting criteria are health status, occupation and leisure pursuits.

5.1.3 Of these criteria, vaccination history might most naturally fall under the individual underwriting criteria within the realm of health status. Determining the health of an applicant generally involves the completion of a medical questionnaire and, occasionally, for large sums insured, a full medical examination by a medical practitioner. Risk factors are body weight, blood pressure, cholesterol levels, evidence of any medical condition (like heart problems, diabetes, HIV status) and family history of specific diseases. These factors are not all modelled separately as part of the Actuarial Society of South Africa’s Continuous Statistical Investigation (CSI) on insured lives, and therefore insurance companies do not tend to have a strong statistical basis upon which to base pricing decisions (ASSA, unpublished). These

factors, therefore, do not usually form part of the pricing model used to calculate standard rates. Instead, a combination of medical evidence and actuarial judgement might be used to determine whether the application is accepted at standard rates, accepted as a substandard risk (which would be associated with a premium loading of typically 100% to 250% of the normal premium rate (Marais, forthcoming: 23)), declined or postponed. Certain health conditions may also lead to exclusion restrictions which might prevent claims related to those conditions from being accepted (Kapur, 2004).

5.1.4 The latter category, exclusion, which is the elimination of coverage for a certain type of risk, would probably be the most justifiable and practical way to introduce vaccination history as a rating factor, as the data to price accurately for the risk of not being vaccinated might not be available. In this scenario, a policyholder who was not vaccinated and whose mortality or morbidity claim was as a result of a VPD would not be eligible to receive the policy benefit.

5.2 Practical considerations

5.2.1 The act of incorporating a rating factor into the insurance underwriting process can be complex, expensive, time-consuming and is not to be taken lightly (Rothstein, 2004: 87). Introducing smoking status as a general underwriting criterion, for example, was an iterative process which took many years of trial and error and building up of data. As mentioned in the previous section, it is not expected that vaccination history would become a general underwriting factor like age, sex and smoking status. It is more likely that exclusion would be the most practical way to account for it, at least initially. It still, however, may be useful to consider the value of vaccination history as a rating factor based on the outcome of a cost-benefit analysis. The specifics of such an investigation are beyond the scope of this paper and would need to meet the standards of each insurer, but a starting point might be to look at what is currently being done in the industry. Discovery's Vitality programme, although not an insurance product in itself, rewards adult members with points for being vaccinated against cervical cancer (via the HPV vaccine), influenza, pneumonia, and shingles (Discovery Vitality, unpublished). Points may then be redeemed in a number of ways on items or activities that add value to the life of the member. Perhaps the data collected on the effectiveness of such a programme could feed into investigations for life insurance, lump sum disability and dread disease or critical illness cover.

5.2.2 Looking at a programme like Vitality might also provide guidance regarding the practical questions that would need to be considered if vaccination history were to be incorporated into the insurance underwriting process, for example: how evidence of vaccination should be collected, how often such evidence would need to be provided (e.g. annually for the influenza vaccine), which vaccines should be included in the underwriting process and, where multiple vaccines are included, whether they should be assessed individually (e.g. exclusion for each disease not vaccinated against) or collectively (preferential treatment only if the applicant has received all vaccines in scope).

5.2.3 Insurance companies might weigh up the pros and cons of taking such a step

from a reputational, political and social point of view. As when introducing any new rating factor, the marketing message would need to emphasise the health and financial advantages to those who take up the benefit rather than the discrimination against those who do not. When smoking status was introduced as a rating factor, for example, the approach was to offer non-smokers ‘preferential rates’, rather than advertise the fact that smokers were being penalised; i.e. encouragement of positive behaviour rather than admonishment of unhealthy choices (Marais, forthcoming: 20). The cultural feelings towards vaccination in South Africa and the likely response of policyholders being made to feel that they have to do something they might not ordinarily have done would need to be considered. The additional cost incurred of including this factor in the underwriting process might need to be borne by the insurance company to avoid a perception of discrimination against lower income applicants.

5.2.4 Being the first entity to introduce a new rating factor may either cultivate a competitive advantage or assign the entity the role of ‘guinea pig’ while the rest of the markets wait to see what will happen. Research into the early mover advantage in the Long-Term Care Insurance (LTCI) space shows that early movers do tend to gain relatively greater market share and are generally more profitable than later entrants (McShane, 2012: 1116). This evidence alone may not be enough to sway insurance companies one way or another. Perhaps, in the case of vaccination, the industry might consider taking a collaborative approach initially in order to share ideas and data that may contribute to the greater good.

5.2.5 Even if it is found that the costs of introducing vaccination history as a rating factor outweigh its potential benefits, the insurer may still wish to encourage vaccination uptake as part of its social responsibility programme and thus improve their claims experience indirectly over time. Investment in adult vaccination education and programmes, or perhaps even working with government to embed a culture of adult vaccination in South Africa may, in the long term, lead to improved mortality and morbidity experience in the insured population and in the population as a whole.

5.3 Legal considerations in South Africa

5.3.1 Marais (forthcoming) summarises legislation governing the South African insurance industry that may be applicable to the introduction of new underwriting factors. This section is based on that summary, as well as some additional information regarding data protection legislation in South Africa.

5.3.2 THE LONG-TERM INSURANCE ACT

5.3.2.1 The life insurance industry in South Africa is governed by the Long-Term Insurance Act, 1998 (LTI Act) (RSA, 1998). The industry is regulated by the Prudential Authority (PA) of the South African Reserve Bank and it is supervised by the Financial Sector Conduct Authority (FSCA).

5.3.2.2 Paragraph 46 of the LTI Act stipulates that the statutory actuary of the insurer must be satisfied that for any kind of policy the insurer issues, “the premiums, benefits and other values thereof are actuarially sound”. Relevant to the inclusion of underwriting factors

is the clause that the insurer may not “make a distinction between the premiums, benefits or other values unless the statutory actuary is satisfied that the distinction is actuarially justified”. Marais (forthcoming: 25) defines the terms ‘actuarially sound’ and ‘actuarially justified’ as the actuary having “sufficient statistical evidence that the premium rates charged for the product should be financially sound—i.e. adequate to cover the risks and costs, with allowance for a reasonable profit margin ... If there is a significant difference in the mortality risk of applicants, so that a distinction in premiums can be actuarially justified, the requirement of financial soundness dictates that a corresponding distinction be made in the premiums charged.” Legally, therefore, the introduction of vaccination history as an underwriting factor would require the insurer to gather sufficient statistical evidence to ensure that the correct premium is charged, and that premium discrimination based on this factor is justified in the first place.

5.3.3 *TREATING CUSTOMERS FAIRLY*

5.3.3.1 Treating Customers Fairly (TCF) is a supervisory regulatory and supervisory approach designed by the Financial Sector Conduct Authority (FSCA) to ensure specific fairness outcomes for financial services consumers.⁴ Financial institutions, including insurers, must “demonstrate that they deliver [six] specified [TCF] outcomes to their customers across the product value chain”. The two TCF outcomes most relevant to the topic of underwriting factors require that “products sold are designed to meet the needs of identified customer groups and are targeted accordingly”, and that “customers are provided with clear information and are kept appropriately informed”. With regard to the introduction of vaccination history as an underwriting factor, the insurer would need to identify the customer groups to whom the benefit of potentially lower premiums would add value, which would most likely be adults who are already vaccinated or who recognise the value in being vaccinated. The insurer would also need to provide applicants and policyholders with clear information around vaccination, which might feed into a larger vaccination education initiative.

5.3.4 *THE PROMOTION OF EQUALITY AND PREVENTION OF UNFAIR DISCRIMINATION ACT*

5.3.4.1 Marais (forthcoming) also makes mention of legislation against unfair discrimination, specifically the Promotion of Equality and Prevention of Unfair Discrimination Act, 2000,⁵ which aims to eradicate “social and economic inequalities, especially those that are systemic in nature, which were generated in our history” (RSA, 2000).

5.3.4.2 The Act lists “the unfair discrimination in the provision of benefits, facilities and services related to insurance” as an unfair practice. For the provision of goods and services in general, the list of unfair practices includes “imposing terms and conditions

4 FSCA website. <https://www.fsc.co.za/Regulatory%20Frameworks/Pages/Treating-customers-fairly.aspx>. Accessed 5 July 2020.

5 Promotion of Equality and Prevention of Unfair Discrimination Act 4 of 2000

that perpetuate the consequences of past unfair discrimination regarding access to financial resources”.

5.3.4.3 In addition to being able to prove that discrimination based on vaccination history is fair, insurers looking to introduce this underwriting factor might also need to ensure that access to vaccination would be affordable and equitable to avoid contravening the Act. This should not be a major obstacle – most vaccinations are affordable, with the 2020 influenza vaccine, for example, starting at R70 (Business Insider South Africa, unpublished).

5.3.5 THE PROTECTION OF PERSONAL INFORMATION ACT

5.3.5.1 Amongst the aims of the Protection of Personal Information Act, 2013 (PoPI)⁶ are “to promote the protection of personal information processed by public and private bodies” and “to introduce certain conditions so as to establish minimum requirements for the processing of personal information”.

5.3.5.2 Paragraph 32 of the Act makes allowance for insurance companies and medical schemes to process a data subject’s personal information “if such processing is necessary for ... assessing the risk to be insured by the insurance company or covered by the medical scheme and the data subject has not objected to the processing”. The Act, however, requires that all South African institutions conduct themselves in a responsible manner when collecting, processing, storing and sharing another entity’s personal information, which include medical records. An insurer incorporating vaccination history into their underwriting process would need fully to comply with PoPI in their processes. This requirement will become increasingly relevant as the insurance industry moves towards utilisation of digital medical records (see section 5.4.9).

5.4 Ethical Considerations

5.4.1 Members of the Actuarial Society of South Africa (ASSA) are governed by a Code of Professional Conduct⁷ which includes the demonstration of ethical behaviour as one of its main principles.

5.4.2 Paragraph 9 of The Code requires that members act honestly, with integrity, competence and due care, and in a manner that fulfils the profession’s responsibility to the public and upholds the reputation of the actuarial profession. Paragraph 11 of The Code states that “In fulfilling assignments, members must consider the likely implications of their recommendations for all parties that are likely to be materially affected, and also draw the attention of their clients to such implications”.

5.4.3 Thus, in considering the implementation of a new underwriting factor, actuaries, as far as their influence allows, must consider their obligation to the insurance company and their duties to the profession and to the public. To include vaccination history

⁶ Protection of Personal Information Act 4 of 2013

⁷ Actuarial Society of South Africa, Code of Professional Conduct, 2012. <https://www.actuarialsociety.org.za/professional-resources-structure/professional-conduct/>. Accessed 7 July 2020.

as an underwriting factor is therefore not only a practical decision, but an ethical one as well. The remainder of this section touches on some of the ethical considerations to be borne in mind when thinking about the introduction of vaccination history as a rating factor in life insurance underwriting.

5.4.4 JUSTICE IN HEALTHCARE

5.4.4.1 Just as the ethics of mandatory vaccination is a field of study in itself, so too is the ethics of insurance and, more specifically, of risk classification and underwriting. Risk classification is often controversial, especially when it makes insurance—which may be seen as a common good—expensive or unattainable for a sector of the population (De Jong & Ferris, 2006: 589). In the 1990s, the literature began questioning standard underwriting practices that excluded people with AIDS from insurance coverage. Daniels (1990) claimed, in the context of the HIV epidemic, that “[j]ustice in health care requires that we protect equality of opportunity, and that implies sharing the burden of protecting people against health risks.” He went on to assert that the attempt to treat actuarial fairness as a moral notion disguises its true purpose, which is to mitigate the risk to insurers of adverse selection and to protect the economic benefits of standard underwriting practices. Standard underwriting practices, he held, are only fair if they are part of a just system, not if they simply are actuarially fair, and the industry must be able to prove that their social benefits outweigh their social costs.

5.4.4.2 In South African insurance today, as a result of the large amount of research done into the mortality of HIV positive lives and antiretroviral therapy (ART) becoming more readily available and better understood, HIV is treated as an impairment, not too dissimilar to other chronic but treatable conditions (Cooper-Williams, unpublished). How would the question of vaccination history factor into Daniels’ definition of justice and fairness? It may be argued that, provided that vaccination is accessible and affordable to all, underwriting based on vaccination history is the fair and just thing to do. Encouraging adequate vaccination in the adult population contributes towards herd immunity and protection of the more vulnerable members of the community, such as children who are not yet immunised or those whose health conditions preclude them from vaccination. In this way, the social benefits reach beyond just the individual in question and greatly contribute towards a just healthcare system.

5.4.5 WHAT MAKES AN UNDERWRITING FACTOR ETHICAL?

5.4.5.1 Underwriting lives for insurance purposes is, by definition, discriminatory. The question is whether this discrimination is fair. Marais (forthcoming) discusses this subject in detail and seeks to define principles for premium discrimination which no-one can reasonably reject and which are, therefore, fair. He suggests some fairness criteria which may be regarded as representing the views of the actuarial profession and then goes on to define his own Fair Discrimination principle, a set of criteria which determine whether a specific underwriting factor is justifiable and fair.

5.4.5.2 The following sections consider briefly how well vaccination history may satisfy each of the criteria.

5.4.6 SUGGESTED FAIRNESS CRITERIA FROM THE FAIR DISCRIMINATION REPORT

5.4.6.1 The following criteria for “assessing the appropriateness and necessity for using a particular underwriting factor” were suggested in the “Fair Discrimination” report to ASSA by Kruger, et al. (unpublished: 5). Marais (forthcoming: 76) notes that “these criteria do not provide an acceptable measure for the fairness of the discrimination based on risk factors as they seem to be more concerned with appearances, opinion, acceptability and the reputation of the actuarial profession”. He does, however, believe that they merit some attention as they may be regarded as representing the views of the actuarial profession. For the sake of completeness, therefore, they have been considered below.

5.4.6.2 RESPONSIBILITY AND INFLUENCE: ARE PEOPLE PARTLY RESPONSIBLE FOR AND DO THEY HAVE INFLUENCE OVER THE FACTOR?

In the case of vaccination, unless there is a medical reason not to be vaccinated, such as age, health conditions, or other factors, and assuming the vaccine is accessible and affordable, people do have influence over being vaccinated or not. By this criterion vaccination history would be a fair underwriting factor.

5.4.6.3 AWARENESS: IS THE APPLICANT AWARE OF THE UNDERWRITING CONDITION?

The applicant should be aware of their vaccination status, which would make the use of vaccination history as an underwriting factor fair. If they do not have access to childhood or adolescent medical records, measures may be taken to ensure that the applicant is, indeed, vaccinated. These measures may take the form of an antibody blood test to gauge immunity, or, what may be simpler in most cases, administration of the vaccination anyway (it is usually safe to repeat vaccines, according to the CDC (unpublished f)). In order to ensure that the applicant was able to provide informed consent, the insurer would need to provide adequate information on the benefits and risks of vaccines—especially in a society where this information is not disseminated widely at a public level.

5.4.6.4 ALTERNATIVE RISK RATING FACTOR: DO ALTERNATIVE RISK RATING FACTORS EXIST THAT ARE MORE ACCEPTABLE?

This criterion implies that if a more acceptable risk rating factor is available, then using vaccination history would not be justified. As has been discussed in this paper, vaccination is currently the most effective, safe and accessible method of preventing contraction, and hence medical consequences, of VPDs. It is not clear whether there are any more acceptable alternatives. In fact, the potential for vaccination history to be used as a proxy for other more invasive or less ethical underwriting factors may be explored as an opportunity to improve current underwriting processes.

5.4.6.5 ACCEPTABILITY AND PUBLIC OPINION: IS THE RISK FACTOR CONSIDERED INAPPROPRIATE BY SOCIETY?

Although there is no necessary link between what society may consider inappropriate and what is morally justifiable, Kruger et al. (unpublished: 7) warn of the reputational danger if the actuarial profession cannot defend such factors with “both statistical evidence and moral justification”. As has been touched on in earlier sections of this paper, vaccination is not without its controversy. Although the government sanctions the use of vaccination via its progressive childhood vaccination programme, it may be argued that the same government has neglected to invest in similar programmes for adults. In a democratic South Africa, it is not a given that the views of the government or influential politicians even hold sway in the court of public opinion. Until the results of the Department of Health’s national household vaccination coverage survey mentioned in paragraph 3.4.3 are made public, it cannot be said unreservedly that the concept of vaccination is embraced by South African society. An insurance company considering incorporating vaccination history as a rating factor in its underwriting process would, as part of its investigative work, gather the opinions of various stakeholders and decision-makers, which might include policymakers, shareholders and policyholders.

5.4.7 THE FAIR DISCRIMINATION PRINCIPLE

5.4.7.1 To ground the justification of the fairness of the discrimination of any underwriting factor in contractualist principles, Marais states that one would need to find a principle of fairness to which no one can reasonably object. For this purpose, he defines The Fair Discrimination principle (Marais, forthcoming: 66):

In terms of its contribution to actuarial equity, a specific underwriting factor for premium discrimination between insurance applicants is justifiable and fair, if it meets the following criteria:

- The statistical evidence to support the discrimination must be strong and reliable
- The allocation of each applicant to a risk group must be unambiguous
- The effect of the factor on mortality must have a reasonable causal explanation.

5.4.7.2 This formulation of the Principle implies that the stated criteria are necessary and sufficient conditions for fairness. In other words, it would be difficult to object to the contribution to actuarial fairness of an underwriting factor that meets all three criteria. Vaccination history as an underwriting factor is measured against each of the three criteria below.

5.4.7.3 IS THE STATISTICAL EVIDENCE TO SUPPORT THE DISCRIMINATION STRONG AND RELIABLE?

To be reliable, a statistical analysis must be based on sufficient data, and the statistical evidence is strong if it shows significant differences in the values investigated. Here the question is whether the mortality and morbidity linked to non-vaccination in the insured

population is sufficiently statistically significant to warrant the inclusion of a vaccination-related rating factor in the underwriting process. A rough estimate of the financial impact of non-vaccination in the insured population has been made in Section 4, but a much more rigorous investigation would need to take place to gather adequate statistical evidence. Rigorous statistical analysis would usually require data for the insured population, which may not be available in this case. Due to the relatively small number of stakeholders who would actively oppose the inclusion of this factor, however, and the fact that it would probably be incorporated as a loading or exclusion rather than as a general underwriting factor, data applicable to the population as a whole might suffice.

5.4.7.4 IS THE ALLOCATION OF EACH APPLICANT TO A RISK GROUP UNAMBIGUOUS?

5.4.7.4.1 If one vaccination at a time is considered, vaccination history might be accounted for in underwriting by a binary distinction between vaccinated and unvaccinated. This distinction would be easily evidenced, and hence each applicant could unambiguously be allocated to a risk group. Vaccination is not 100% effective, and there would always be cases of vaccinated policyholders contracting a VPD. This, however, is not a reason to disregard vaccination as a rating factor, as it is similar to non-smokers developing lung cancer, or young people dying unexpectedly. As long as the proportion unvaccinated lives suffering from VPDs is significantly larger than that of vaccinated lives, vaccination history is still a potentially valid rating factor.

5.4.7.4.2 Consideration would need to be given to those applicants who cannot be vaccinated for medical reasons. In these cases, their premium loadings based on pre-existing health conditions might already adequately reflect their riskiness, and hence penalisation for being unvaccinated may not be necessary.

5.4.7.5 DOES THE EFFECT OF THE FACTOR ON MORTALITY HAVE A REASONABLE CAUSAL EXPLANATION?

A plethora of research has been done over centuries—and continues to be done—which proves the efficacy of vaccination, some of which has been cited in this paper. This body of literature could be used as evidence that vaccination does, indeed, have a causal effect on mortality and morbidity with respect to VPDs.

5.4.7.6 Measured against the criteria of the Fair Discrimination Principle, vaccination history as a rating factor meets the criteria of unambiguous allocation and reasonable causal explanation. More research is needed into whether it also meets the criterion of strong and reliable statistical evidence before it can be concluded that the rating factor is justifiable and fair in terms of its contribution to actuarial equity. Because, however, this factor is not likely to have a significant effect on premiums and assuming most stakeholders will be supportive of its inclusion in principle, the statistical evidence may not need to be as meticulous as for other rating factors.

5.4.8 COVID-19: AN ETHICAL EMERGENCY

5.4.8.1 If the insurance industry ultimately exists as a social good and actuaries, as key workers in that industry, have an obligation to serve the public interest, then surely the industry is duty-bound to assist, in its own capacity, in times of crisis.

5.4.8.2 The Covid-19 pandemic has exposed and exploited long-standing weaknesses in many areas of society, including in the healthcare system. Following trends around the world, when Covid-19 cases began surging South African doctors had to start turning patients away due to the shortage of hospital beds (Business Tech, unpublished). For this reason alone, international medical experts started urging doctors to strongly encourage vaccination in their communities. The contraction of a VPD is exceptionally dangerous during pandemic times due to the lack of medical resources available should a case become serious and require hospitalisation. Furthermore, a number of infections which may arise as complications of Covid-19, such as pneumonia and influenza, can be prevented by vaccination, reducing the incidence of serious Covid-19 cases (Medscape, unpublished).

5.4.8.3 Hospitals were not the only institutions turning away patients. The pandemic quickly affected the world of underwriting. By mid-2020, many insurance companies in South Africa had started applying stricter underwriting measures (in the form of either temporary or permanent additional premium loadings) to those applicants with impairments known to be associated with higher Covid-19 morbidity and mortality rates.⁸ This development brings to mind the 1899 *British Medical Journal* article referred to in section 1 and begs the question: if it is deemed sensible to add loadings until a vaccine is found (or the pandemic passes in another way), would it not then follow that loadings, exclusions or discounts should be applied based on vaccination history after the vaccine becomes available?

5.4.8.4 Covid-19 has shone a spotlight on the importance of vaccination, but it is a practice which has always been important and which will remain relevant, even more so once a Covid-19 vaccine becomes available. The insurance industry has the ability and, arguably, an ethical duty, to provide relief to the healthcare system by encouraging the uptake of vaccinations. It can do so via an intervention known as ‘nudging’. Nudges can be defined as “interventions that steer people in particular directions but that also allow them to go their own way.” (Sunstein 2015, p. 417). The important aspect of a nudge is that it “must not impose significant material incentives (including disincentives)” (ibid.) and that it must preserve freedom of choice. Including vaccination history as a rating factor in life insurance by, for example, offering vaccinated applicants a discounted premium, or excluding the risk posed by unvaccinated applicants, could provide an efficient nudging strategy for preventing death and morbidity and achieving herd immunity without exerting any form of coercion. Furthermore, insurance companies, as institutions generally trusted by their policyholders and the public, have the ability to plug the education gap on adult vaccination to an extent:

⁸ Coetzer, P (personal communication, 27 July 2020). Dr Coetzer is an independent insurance medical consultant.

if insurance companies consider the risks of not being vaccinated high enough to affect one's premium, then perhaps, for both health and financial reasons, it is worth being vaccinated.

5.4.9 ACCESS TO MEDICAL RECORDS IN A DIGITAL AGE

5.4.9.1 One of the practical considerations of incorporating vaccination history (or any factor) into the underwriting process is the question of how evidence can be collected. For many adults, medical records documenting their childhood vaccinations may no longer be available, but this should not be an impediment to pursuing the idea of using vaccination history as a rating factor, for a number of reasons. Firstly, it has already been established that, in most cases, it is safe—and often beneficial—for adults to be revaccinated. Secondly, some vaccines might not have been available when these adults were children, with new vaccines for some illnesses, such as influenza, being produced and needing to be administered every year. This means that applicants should be able to get most vaccinations as adults and should not have to rely on their childhood medical records to provide evidence of vaccination. Thirdly, as the world moves towards digitalisation, which includes the storage of medical data, missing vaccination cards and other paper-based medical records will become less of an issue. On the contrary, medical records are likely to become so accessible that the responsible handling thereof will become an ethical question in itself.

5.4.9.2 The specific question of the ethical implications of using a patient's vaccination history as a rating factor in life insurance underwriting touches on this broader discussion regarding the ethics of access to digital medical records and data protection. While the discussion is not specific to any one rating factor, vaccination history, as a binary 'yes' or 'no' data entry, could be seen as a convenient starting point for the inevitable ethical thinking that will need to happen as the world—and even the sluggish insurance industry (McKinsey & Co., 2018)—continues to move away from paper-based systems towards digitalisation.

5.4.9.3 The Chartered Insurance Institute in the UK has done work to examine how shifting the medical profession and insurers towards sharing electronic health records (EHRs) can improve access to insurance for consumers. Their 2019 report outlines what work needs to be done in order to build trust in EHRs and eventually save the insurance industry from having to make underwriting decisions and decide claims based on paper reports from the medical profession. They explain how digital medical records could speed up the underwriting and claims handling process, while emphasising the need to keep in mind the actuarial profession's responsibility of stewardship of personal data (Chartered Insurance Institute, 2019).

5.4.9.4 The advancement of digitalisation and big data has highlighted the need for legislation aimed at protecting the personal data of the public, and this has been reflected in the development of legislation such as the Protection of Personal Information (PoPI) Act in South Africa and General Data Protection Regulation (GDPR) in Europe. While there is little doubt that giving insurers greater access to digital medical records will offer benefits for both policyholders and insurers, there are important ethical issues that need to be addressed to be sure that the information accessed will be used in the best interests of policyholders.

5.4.9.5 Minty (unpublished) outlines four requirements that he describes as “the ingredients of trustworthiness”. These are elements that insurers need to have in place in order to build trust with policyholders and ultimately succeed in obtaining and retaining access to digital medical records. The ingredients are:

- **Competency:** will medical records be handled with a similar level of skill and competence as the medical professional who wrote them?
- **Reliability:** can the insurer be relied on to use the information with fairness and honesty?
- **Honesty:** will access to digital medical records fulfil the promise of greater certainty in underwriting and in the settling of claims?
- **Goodwill:** do both the insurer and consumer want to make this happen for the mutual benefit of both parties?

5.4.9.6 As mentioned above, vaccination history, due to its straightforward nature, may be a very good starting point for insurers looking to venture into the realm of digital medical records, provided that they can prove that such access is justifiable and will be handled ethically. The acceleration of digitalisation that Covid-19 has brought about (Vebist, unpublished; Deloitte, unpublished) may push the insurance industry to do so sooner than expected.

6. CONCLUSION AND NEXT STEPS IN A POST-COVID WORLD

6.1 At the time of writing, the full impact of Covid-19 has not even begun to be felt, but the pandemic has already aggravated weaknesses in all the societies it has affected. In South Africa, long-standing issues of inequality, inefficiency and misaligned priorities have been brought to the fore as vast sectors of the population are faced with a life- and livelihood-threatening lack of resources.

6.2 While on the one hand the pandemic has brought the world to a standstill, on the other hand it has pushed the fast-forward button on decisions and processes that, in more normal times, could have taken years of deliberation to reach fruition. Within weeks of being declared a global pandemic, Covid-19 had visibly accelerated what was already a blazing trajectory towards digitalisation and set the scene for a world of increased surveillance (Harari, unpublished). This will affect, amongst many other things, the interaction between healthcare and insurance, as the case for insurer access to digital medical record grows, alongside insurers’ ethical responsibilities to protect policyholder data.

6.3 The pandemic has already affected and will continue to shape not just our healthcare systems, but also our economy, politics and culture. And, to contextualise the ideas put forward in this paper, it is impossible to consider the subject of vaccination without thinking about Covid-19. While not even Covid-19 can kill the anti-vax movement (Megget, 2020), it is unimaginable that the general public—who have had the vaccine-afforded privilege of

living in a world that is not totally at the mercy of infectious diseases⁹—will not be more aware of the impact of vaccination and the devastation a disease can cause.

6.4 There is overwhelming evidence to suggest that vaccination is one of the most effective healthcare interventions of our time, yet vaccination coverage is much lower than what it should be, especially for adults. This is evidenced by the thousands of people seeking medical treatment for, and dying of, VPDs each year. The death toll in itself is significant, but it is the morbidity toll—the ongoing treatment and medication that shingles, influenza, pneumonia and cervical cancer patients require, and the ripple effect thereof on the broader economy—that seems to be placing the heaviest financial burden on the healthcare system and the insurance industry.

6.5 There do not appear to be any serious practical or ethical barriers to inclusion of this factor in the underwriting process. To be seriously considered for use by an insurance company, however, the impact of vaccination on insured lives' mortality and morbidity would need to be rigorously investigated and analysed. It is not likely that its inclusion as a rating factor would vastly affect a company's bottom line, and it is foreseen that it would give rise to an exclusion-related clause rather than become a main underwriting criterion. Its impact from both a financial and, more importantly, a social responsibility point of view, may, however be material enough to warrant the work needed to incorporate it into future offerings and processes.

6.6 In a digital age of social media, influencing and cancel culture, the public, especially the generation that will rebuild the post-Covid-19 world, is more conscious than ever of the ethical responsibilities of big corporations. Perhaps that makes now, while the world waits with bated breath for news of a Covid-19 vaccine, the perfect time to consider the role the insurance industry should be playing in the drive towards universal vaccination coverage. And perhaps it makes here, South Africa, with its historically high incidences of infectious diseases, traditionally innovative insurance industry, and unsinkable spirit of ubuntu, the right place to do it.

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⁹ According to the CDC, nearly everyone in the US got measles before there was a vaccine, and hundreds died from it each year. Today, most doctors have never seen a case of measles (CDC, unpublished g).

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