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Some Health

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An independent academic psychologist, based in England, who has written extensively on different areas of psychology with an emphasis on the critical stance towards traditional ideas.

A complete listing of his writings at http://psychologywritings.synthasite.com/. See also material at https://archive.org/details/orsett-psych.

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1. IRRITABLE BOWEL DISEASES

Torres and Ungaro (2022) began: "Inflammatory bowel diseases (IBDs), comprised of Crohn's disease (CD) and Ulcerative colitis (UC), are complex diseases with heterogenous and multi-phenotypic presentation causing significant impact on the quality of life of patients" (p1) (appendix 1A).

Symptoms can include increased stool frequency, incontinence, blood in the stools (hematochezia), and abdominal discomfort. CD affects various parts of the intestines, and it is associated with poor quality of life, sleep disturbance, and a high level of disability (Yzet et al 2022). They can lead to progressive bowel damage (Reves et al 2021).

"Being diagnosed at a young age, patients frequently require long-term chronic medications and may experience complications such as hospitalisations and surgery" (Reves et al 2021 p1).

"Although the exact pathophysiology of IBD remains elusive, available evidence suggests that a dysregulated immune response towards the microbiome in genetically and environmentally susceptible individuals induces and maintains tissue damage" (Alsoud et al 2022 p1).

Provision of treatment for these diseases is a challenge. Tumour necrosis factor (TNF) antagonists [1] have a breakthrough in the 21st century. "These novel therapies significantly improved care beyond the conventional therapeutic arsenal, offering advances in the ability to induce and maintain remission, heal the intestinal mucosa, restore quality of life, and reduce surgeries and hospitalisations. However, there remains a considerable proportion of patients that will be refractory to TNF antagonists or will lose response over time..." (Torres and Ungaro 2022 p1).

Reves et al (2021) detailed seven "unmet needs" in IBDs:

i) Risk stratification - ie: predicting who will benefit from early treatment.

ii) The best treatment for an individual patient.

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[1] Also called monoclonal anti-bodies against tumour necrosis factor alpha" (anti-TNF-alpha) (eg: "infliximab" (appeared in 1998), "adalimumab") (Juillerat et al 2022). The over-riding term "biologicals" is used because they have a variety of mechanisms of action against the immune system. "Vedolizumab" and "ustekinumab" are two slightly different agents to anti-TNF that reduce immune system activity (eg: interleukin 23p19 inhibitors) (Juillerat et al 2022).

iii) "Therapeutic ceiling" - Many sufferers do not respond to treatment, and this is known as the "therapeutic ceiling". However, response or remission depends on the treatment goal set.

iv) Treating special patient populations (eg: elderly patients).

v) Monitoring of treatment success or failure.

vi) Restoring quality of life - "Restoration of quality of life should be the ultimate long-term outcome in IBD management. Although disease remission can be achieved, some bothersome symptoms can still prevail, limiting the achievement of this goal. Fatigue is a common symptom in IBD patients that can be present in more than half of the patients with quiescent moderate-to-severe disease... Moreover, most of these patients suffer from anaemia, which also leads to fatigue, with a negative impact on quality of life" (Reves et al 2021 p4).

Around one-fifth of IBD patients also experience anxiety and depression (Reves et al 2021). Mikocka-Walus et al (2016), for example, reported anxiety as over twice as high among individuals with IBDs than non-sufferers (19.1% vs 9.6%), and depression nearly twice as high (21.2% vs 13.4%) (Knowles et al 2018).

vii) De-escalation/ending of treatment - This is important particularly where there are concerns around the long-term safety of treatments, as well as the cost of continuous medications.

Building on the "unmet needs", IBDs are conditions that raise a number of issues that medicine and healthcare faces in a variety of ways.

1. Certain IBDs have no approved medication (eg: pouchitis; Kayal and Dubinsky 2022). This means medical management of conditions in different ways with varying evidence base. For example, anti-biotics have more support than faecal microbiota transplant (Kayal and Dubinsky 2022).

2. Medications that are effective in the short term, but not longer term as patients relapse despite taking the medication uninterrupted. For example, over half of CD sufferers taking TNF antagonists can relapse in the long-term (eg: one year) (Yzet et al 2022). Thus an

interest in new medications and mechanisms of action.

One new type of medication is Janus kinase (JAK) inhibitors (eg: Tofacitinib), which are "small molecule inhibitors that act on signal transduction from within the cell, specifically inhibiting signal-transducing tyrosine kinases, the Janus kinases" (Spiewak and Patel 2022 p1) [2].

3. The heterogeneous nature of IBDs in terms of symptoms, disease course, and complications. In other words, two sufferers of the same condition can show different manifestations.

For example, colonic and ileal CD are quite "dissimilar" in clinical manifestation, and "there is accumulating evidence from epidemiological, genetic, microbial, immunological, and clinical characteristics that clearly indicate that ileal Crohn's disease represents a distinct disease entity, which differentiates itself from colonic Crohn's disease. This is also reflected by lower efficacy of targeted therapies in isolated ileal compared to colonic Crohn's disease" (Atreya et al 2022 p1).

Atreya et al (2022) commented that CD "should in future probably not be defined as one disease anymore that subsumes all type of different manifestations, but should rather be defined by specific biological changes that drive the disease at the respective site of inflammation" (p1). There is an important implication that the efficacy of treatments may vary with the specific disease. For example, differences in symptom remission to anti-TNF agents in controlled trials (eg: types of CD; Sandborn et al 2011)

4. The hope of personalised treatment. Finding the right treatment is a concern. "Currently, assigning therapies is based on clinical features, co-morbidities, side effects and patient preference on mode of delivery of the drug and its speed of action. Furthermore, many clinical and laboratory variables have shown an association with (non-) response to available therapies such as disease duration, previous exposure to anti-tumour necrosis factor alpha (anti-TNF-a) biologicals, baseline laboratory values (such as albumin, C reactive protein (CRP) and calprotectin), increased weight and previous bowel resection... While these features may be informative to some extent, none of them could predict the likelihood for a certain drug to induce

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[2] One avenue of treatment could be non-traditional medication, as in the example of indigestion (appendix 1B).

disease remission in a certain patient at a certain time with reliable accuracy" (Alsoud et al 2022 p1).

One possibility is to find biomarkers (eg: specific genes) that can be used to guide personalised treatments by predicting the response to a particular drug or mechanism of action (Alsoud et al 2022).

5. The quality of life of sufferers.

UC is a chronic inflammation of the colon, which can remit and relapse over time. Ulcerative proctitis (UP) (which is related to the rectum - eg: bleeding; loose stools or constipation) can occur in up to half of sufferers of UC. "UP follows an indolent course in the majority of patients with predominantly mild disease activity. However, symptoms can be very distressing and associated with a reduced quality of life despite appropriate therapeutic interventions" (Michalopoulos and Karmiris 2022 p1).

Research on quality of life (QoL) among individuals with IBDs has increased in recent years (eg: 400 publications per year between 2013 and 2017) (Knowles et al 2018). In a review, Casellas et al (1996) found poorer QoL among IBD sufferers than healthy controls, not surprising, but also poorer than individuals with other chronic health conditions (Knowles et al 2018).

Knowles et al (2018) developed these comparisons in their meta-analysis of controlled studies (n = 30). Individuals with IBDs scored significantly lower on generic QoL measures than healthy controls, and even lower using IBD-specific QoL measures. The difference "held for both mental and physically focused QoL, and across children and adults" (Knowles et al 2018 p750).

Compared to other chronic illnesses, the finding was "less clear cut" (Knowles et al 2018 p750). There was no difference in studies of adults, whereas children with IBDs had better QoL scores. "Study quality was an issue as most studies used convenience samples, and only 2 studies matched samples on personal characteristics (age, sex) even though matching for demographics is critical when comparing across disease types. Further, very few studies aimed to account for disease characteristics such as activity or duration across the comparative groups. For example, QoL may well be better for individuals with cancer in remission than for those with active IBD due to the interference of ongoing symptoms in the latter group" (Knowles et al 2018 p750). The QoL measure used was another methodological issue.

6. The use of immunosuppressant medications for IBDs presented a particular risk with covid-19. The "Surveillance Epidemiology of Coronavirus Under Research Exclusion for Inflammatory Bowel Disease" (SECURE-IBD) database was set up to help physicians with management of IBD medications and covid-19 (Kamath et al 2022).

Based on the SECURE-IBD data, Kamath et al (2022) commented on four groups of medications:

i) Mesalamine/sulfasalazine - No statistically significant association found between taking these medications and adverse covid-19 outcomes (eg: hospitalisation).

ii) Systemic steroids - Individuals already taking these drugs before a covid-19 infection had a two- to four-fold higher risk of severe covid-19 outcomes (including death).

iii) Budesonide - Limited data available.

iv) Biologic and immuno-modulators - No increased risk with TNF antagonist agents, even possibly a decreased risk of severe covid-19 outcomes (ie: a blunting of the "cytokine storm" seen in severe covid-19).

Thiopurine monotherapy, for example, was associated with an increased risk of infection generally.

Kamath et al's (2022) conclusion was IBD patients should remain, in the main, on their medications because such individuals "can have a spectrum of disease presentations during the covid-19 pandemic whether asymptomatic or leading to hospitalisation, respiratory failure, or death" (p3). Specific advice would be given on an individual basis. During the pandemic, following social distancing, and masking rules, and so forth was crucial (for everyone).

APPENDIX 1A - RAISING AWARENESS

"Invisible conditions used to be just that: hidden away, misunderstood and more often than not ignored. Not anymore. Thanks in large part to social media, awareness of everything from mental health conditions to chronic pain, fatigue, to neurodiversity has never been higher" (The leader 2023 p5). This is a positive thing as individuals can find support and challenge the isolation and stigma often felt.

But increasing awareness can increase the reporting of symptoms. "The effect was especially seen in those who were already vulnerable to mental health problems, perhaps because they were being encouraged to focus on negative thoughts and feelings without sufficient support to help them deal with them" (The leader 2023 p5).

Also there is "concept creep", where terms become so general in their use that everyday behaviours are classed as problems, and the original terms lose their value. Add to this, the potential for profit, and there is a risk of overdiagnosis and overmedication (The leader 2023).

APPENDIX 1B - INDIGESTION

Functional dyspepsia (indigestion in everyday language) is often treated proton pump inhibitor (PPI) medication. Despite the effectiveness, there are side effects with this over-the-counter medication (Kongkam et al 2023).

Turmeric (active compound: curcumin) is an alternative medication used. "However, conventional physicians have been hesitant to consider this herbal medicine as the primary treatment for functional dyspepsia, mainly due to a lack of research comparing the effectiveness and side effects of curcumin with PPIs" (Kongkam et al 2023 p2).

Kongkam et al (2023) reported such a study in Thailand. Dyspepsia patients recruited in 2019-21 were randomised to curcumin, omeprazole (PPI), or both together. One hundred and fifty-one participants completed the study (ie: 28 days of treatment and follow-up at 56 days). Dyspepsia symptoms were measured by two validated questionnaires. All three groups showed significant improvements in symptoms at Days 28 and 56. There was no significant difference between the groups suggesting that curcumin could be as effective as PPIs for functional dyspepsia.

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2. NEGLECTED TROPICAL DISEASES

2.1. Strategies to combat neglected tropical diseases
2.2. School-based programmes
2.3. Transmission of helminth infections
2.4. River blindness
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2.1. STRATEGIES TO COMBAT NEGLECTED TROPICAL DISEASES

"The neglected tropical diseases (NTDs) are a diverse group of, mainly infectious diseases (including viral, bacterial, protozoan and helminth infections) that mostly affect impoverished communities, with a disproportionate impact on women and children. They prevail in tropical and sub-tropical conditions of the world, and 1.65 billion people are estimated to be infected with at least one NTD worldwide" (Forbes et al 2023 p1). The World Health Organisation (WHO) has prioritised twenty to deal with by 2030 (table 2.1).

- Eradication – yaws; Guinea worm.

- Elimination as a public health problem (EPHP) – rabies; trachoma; soil-transmitted helminiases; Chagas disease; rhodesiense; visceral leishmaniasis; lymphatic filariasis; schistosomiasis.

- Elimination (interruption) of transmission (EoT) – leprosy; gambiense; onchocerciasis.

- Control – dengue; Buruli ulcer; mycetoma; echinococrosis; cysticerosis; food-borne trematodiases; scabies; snakebite envenoming.

(Source: table 1 Forbes et al 2023)

Table 2.1 – Twenty NTDs prioritised by the WHO.

Two main strategies to combat NTDs can be used – innovative and intensified diseases management (IDM), and preventive chemotherapy (PC). "For the former, the primary method of control is through detection and (sometimes prolonged) treatment and management of identified cases, which requires strengthening of health systems. For the latter, PC is a cornerstone of the global NTD programme, where PC is defined as large-scale delivery of safe, quality-assured medicines, either alone or in combination, at regular intervals to entire population groups at risk, without the need for individual diagnosis before each treatment round" (Forbes et al 2023 p3).

EoT or EPHP are two criteria for success of PC. "Typically, EPHP will result in the reduction or cessation of mass drug administration (MDA)" (Diggle et al 2023 p1). But knowing the prevalence of a disease is key here. "Prevalence surveys are the backbone of NTD programmes' monitoring and evaluation frameworks. As more countries achieve success through MDA, there is a growing need to conduct prevalence surveys to determine whether mass treatment can be stopped" (Diggle et al 2023 p7). Any such study depends on the sampling of villages, say, and individuals within them, and then statistical modelling of overall prevalence.

NTDs have a range of adverse health outcomes, from reversible to irreversible, and death. "For some NTDs, the most severe clinical manifestations develop over many years of chronic or repeated infection. For these diseases, the association between infection and risk of long-term pathology is generally complex, and the impact of multiple interacting factors, such as age, co-morbidities and host immune response, is often poorly quantified" (Borlase et al 2023 p1).

Cumulative exposure and dose-response relationship are concepts here. The idea is a threshold below which outcomes will not be observed, and higher thresholds that lead to more severe outcomes. For example, helminths, and the "worm burden" will vary between individuals. Many people in a population have a few worms with limited effects on health, but a higher number leads to worse health. For schistosomiasis (table 2.2), heavy-intensity infection has been defined as more than fifty eggs per 10 ml of urine (in urogenital schistosomiasis), and more than 400 eggs per gram of stool (in intestinal schistosomiasis) (Borlase et al 2023).

The tests to detect these eggs include Kato-Katz thick smears, and point-of-care-circulating cathodic antigen test (POC-CCA). The former analyses stool samples through a microscope, and so is costly, and takes at least three days, but it can detect other helminths infections. The POC-CCA is used with urine, requires no equipment, and can be read by the naked eye. A ten-point scoring system based on intensity is used, though there is some disagreement over the cut-off point (Kabbas-Pinango et al 2023). The cut-off score is important in relation to "false positives" (scored as infected cases but are not so) and "false negatives" (scored as not infected but the individual is infected).

- "Schistosomiasis is caused by parasites of the Schistosoma genus [3], which have a complex life cycle mediated by a freshwater snail intermediate host. Adult worms live in the blood vessels of human hosts, and the majority of morbidity is caused by immune-mediated responses associated with parasite eggs trapped in host capillaries and tissues. In the case of urogenital schistosomiasis, caused by S. haematobium, this causes haematuria (blood in the urine) and a range of long-term pathologies, including fibrosis and calcification of the urinary tract, obstruction of urine flow, genital schistosomiasis, and, rarely, bladder cancer. In the case of intestinal schistosomiasis, in Africa primarily caused by Schistosoma mansoni, and in Asia primarily caused by Schistosoma japonicum, infection causes acute morbidities such as abdominal pain, blood in faeces, diarrhoea and anaemia, and long-term pathologies include periportal fibrosis, which can lead to portal hypertension, hepatosplenic disease and in extreme cases fatal haemorrhages... The majority of pathology associated with schistosome infections is not due to the worms themselves but immunopathological reactions to schistosome eggs trapped in host tissue" (Borlase et al 2023 p10).

Table 2.2 - Schistosomiasis.

2.2. SCHOOL-BASED PROGRAMMES

Soil-transmitted helminths (STH) are worm infections which can be dealt with via school-based MDA programmes (eg: "National Deworming Day" in India) (Bundy et al 2023). The WHO estimated that 3.3 billion treatments for STH infection have been delivered in schools since 2010 (Bundy et al 2023). The "London Declaration" in 2012 created coalitions with the WHO for MDA programmes by increasing drug donations from pharmaceutical companies (eg: mebendazole manufactured by "Johnson and Johnson" for STH) (Bundy et al 2023).

The assumption of school-based programmes is that "the worm burden — the number of adult worms present in an infected host — was density-dependent and thus both morbidity and transmission were scaled by the number of worms present, and so both would decline with treatment

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[3] There are six main species of trematodes of the Schistosoma genus causing schistomiasis in humans (Kabbas-Pinango et al 2023).

that expelled adult worms and reduced the size of the worm population. Infection intensity is typically host age-related, with the highest intensity of infection for roundworm, whipworm and schistosomes in school-age children. Hence a disproportionate reduction in disease should result from treating school children since they are the most intensely infected age group in the population" (Bundy et al 2023 p3).

The presence of worms impacts children's health, and so deworming programmes should show benefits in the short-term (eg: estimates of weight increases of around 0.1 kg compared to infected controls), and long-term (eg: increased school attendance, and qualifications, and subsequently higher income) (Bundy et al 2023).

More widely, school-based programmes can be used. "Schools represent a cost-effective and efficient platform through which to deliver an essential integrated package of health and nutrition services that goes beyond deworming to address school meals, water, sanitation and hygiene (WASH), menstrual health and some of the other common issues that emerge during school-age and adolescence" (Bundy et al 2023 p6).

School closures during the covid-19 pandemic highlighted "the vital role that schools play in protecting the health and well-being of learners. It has provided the counter-factual evidence of what happens when school-based health services, including deworming, are no longer provided. This experience has strengthened countries' resolve to integrate school-based NTD programmes in their investment in the education and well-being of children, and to create a global Coalition to help make that happen" (Bundy et al 2023 p6).

At the same time, Bundy et al (2023) raised a word of caution that school-based programmes "cannot be the whole solution. Free or subsidised MDA is a move towards essential health service provision, but viewing this as a proxy for universal health coverage (UHC) masks both the current inequities in provision and the lack of patient control over treatment options. Providing on-demand medicines through primary healthcare facilities raises challenges, including willingness-to-pay for preventative treatment and capacity of health systems to pay for diagnostics" (p9) (appendix 2A).

Bundy et al (2023) ended on a positive note, however: "For thousands of years, we have been aware of worm infections of humans, and the ill-health they cause, but it is only in the last 5-10 years that the world has made significant progress in controlling these infections as a public health problem" (p10).

2.3. TRANSMISSION OF HELMINTH INFECTIONS

"Human helminth infections enter a human host as larval stages, reach maturity within the human host and reproduce sexually to release further transmission stages to infect either an intermediate host such as an insect or snail or a further human host. Their offspring leave the body as fertilised eggs or larval stages, and transmission between people occurs indirectly, either through environmental reservoirs of contaminated soil, water or via vector species" (Collyer et al 2023 p2). Globally, over two billion people are affected (Collyer et al 2023).

Heterogeneity of worm burden is commonly observed, where "the majority of individuals in localised surveys of endemic areas harbour small burdens, and a small number of individuals harbour very large burdens and are presumed to contribute disproportionally to ongoing transmission" (Collyer et al 2023 p2). This difference between individuals is "generally assumed to be a product of unequal risk (owing to occupation, access to adequate sanitation, housing quality etc) and predisposition (perhaps triggered by acquired immunity, or genetic background)" (Collyer et al 2023 p2).

MDA in schools has been successful, but "[A]s prevalence falls year by year, marked heterogeneity in infection levels is often observed owing to local differences in both the coverage and compliance to treatment, and environmental conditions. In these circumstances, it is be important to develop an understanding of what influences the chance of elimination of transmission in the long term in a defined locality, and what are the chances of infection resurgence post mass drug administration (MDA) cessation" (Collyer et al 2023 p3).

Using data from Kenya on hookworm transmission (in 2015-17) in a modelling study, Collyer et al (2023) found that rates of people movement between villages was a key variable in the possible widespread bounce-back of infection after MDA.

"The measurement and prediction of the spatial distribution and spread of infection within and between defined population units, eg: towns, cities and villages, are vital considerations for planning epidemiological interventions" (Collyer et al 2023 p1). Movement includes day-to-day short journeys (eg: home to shops; commuting to work), and longer distance.

Collyer et al (2023) ended that their findings "bring into question the long-term effectiveness of mass deworming as a stand-alone method of control, and suggest that lasting elimination will require MDA interventions to be accompanied by large-scale improvements to sanitation and hygiene" (p8).

2.4. RIVER BLINDNESS

Onchocerciasis ("river blindness") is transmitted via blackflies, and it is endemic in sub-Saharan Africa. MDA using ivermectin has been tried since the 1990s (known as "annual community-directed treatment with ivermectin"; aCDTI).

EoT with aCDTI has four major impediments (Kura et al 2023):

i) Some communities have not received the drug or have only just started using it. This is often the case in "low-biting" (or hypoendemic) areas (ie: low prevalence of the disease).

ii) In "high-biting" areas, low adherence to the drug (ie: not all eligible individuals take the drug) or "timing of ivermectin treatment relative to transmission seasonality may not be optimal" (Kura et al 2023 p2).

iii) Non-response to ivermectin (eg: not killing all parasites).

iv) Co-morbidity with loiasis, and the risk of severe reactions to ivermectin.

Alternatives to ivermectin include moxidectin 9approved in the veterinary field in the USA), which in clinical trials has proved superior to ivermectin (Kura et al 2023). Kura et al (2023) provided evidence via statistical modelling for biannual MDA with moxidectin to achieve EoT.

2.5. LEPROSY

Leprosy (or Hansen's disease) is a NTD caused by particular bacteria [4]. Elimination is defined by the WHO as less than one case per 10 000 population, and this occurred in most countries by 2010. However, there are still 100 000 new cases globally each year (Davis et al

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[4] Only a small percentage of individuals infected with Mycobacterium leprae develop clinical disease (Dharmawan et al 2021).

2023). A better measure is "non-endemic status", defined as "when leprosy is not normally present among the autochthonous population in the area or country, but sporadic cases may occur" (Davis et al 2023 p2). In 2019, 45 countries detected no new cases, and 99 countries had fewer than 1000 new cases (Davis et al 2023). "However, setting verifiable criteria for classifying non-endemic status is a problem that has proven challenging for a number of diseases due to the random fluctuations that tend to occur at low incidence levels" (Davis et al 2023 p2).

Establishing elimination or non-endemic status faces three main challenges (Davis et al 2023):

i) The delay from symptom onset to diagnosis - eg: lack of pain from symptoms or fear of stigma may prevent help-seeking behaviour. An average of 1-8 years in two studies (Davis et al 2023).

ii) Difficulties in identifying exposure to the disease.

iii) The incubation period of leprosy - An average of 4 years in one study, but even as long as 20 years (Davis et al 2023).

Davis et al (2023) concluded: "The long incubation and detection delays associated with leprosy require case detection and treatment to be ongoing for 10 or more years following cessation of transmission, and an extended period of observation to verify non-endemic status" (p6).

Dharmawan et al (2021) performed a systematic review of the factors linked to delayed leprosy detection, and found twenty-seven relevant studies published between January 2000 and January 2021. Delayed detection was defined as "Grade 2 Disability" (ie: "visible deformities due to leprosy neuropathy"; Dharmawan et al 2021 p2).

The average delay varied depending on the statistics used - a median ranging from 12 to 36 months, but a mean ranging from 11 to 64 months.

The factors in delayed detection included:

a) Not seeking medical help - eg: taking no action in response to signs and symptoms; visiting traditional or alternative healers. However, diagnosis by local health professionals was not always guaranteed, and individuals could have several visits before referral to specialist services.

b) Individual factors:

- Age – older individuals and delayed detection.

- Sex – a shorter delay among women.

- Type of leprosy – longer detection delay with multi-bacillary leprosy than paucibacillary leprosy.

- Symptom perception - "Most patients either did not know the signs or symptoms of leprosy, and therefore ignored them; or, even if they noticed them, thought they would disappear spontaneously" (Dharmawan et al 2021 pp9-10). Lack of knowledge generally about leprosy was associated with delay.

c) Socio-economic factors – eg: delayed detection was associated with a longer distance to health services, and lower paid/unemployed status.

d) Social and community factors:

- Stigma – a significant relationship between stigma and delayed detection, particularly around fear of isolation.

- Beliefs – eg: high trust in traditional healers and delayed detection.

The different factors interacted, particularly around seeking medical help. Dharmawan et al (2021) explained: "Health-service seeking is a complicated issue, as it involves a complex paradigm of social, historical, cultural, and economic variables, all of which define a person's mindset. There are several reasons why people with leprosy may not seek care: stigmatisation, social values, poor knowledge of leprosy signs and symptoms, and poor access to healthcare services. The extent to which people are able to correctly interpret the early or later symptoms of leprosy is associated with their level of knowledge. It will also influence their health-service-seeking behaviour. People who misinterpret their symptoms or do not recognise them are more likely to ignore the first signs of their disease and thus take no action. Like stigma and social values, beliefs that leprosy is caused by a curse or a spirit or other supernatural cause may also cause people who have early signs of leprosy not to seek timely treatment at qualified healthcare services, but to take self-medication, visit non-qualified practitioners of traditional or popular medicine, or visit a medicine shop. Stigma and the fear of it can lead people with leprosy to conceal their condition, or to visit a distant health centre in order to avoid being recognised by people from their community, and could thus cause delayed case detection" (p11).

The review confirmed the link between delayed detection and the risk of disability, which "can also become part of a vicious circle: because patients with visible disabilities and ulcers on their hands and feet often face stigmatisation, they may postpone help-seeking, thus further delaying detection. Even if the leprosy infection is cured, leprosy patients may have lasting physical and mental disabilities, and continue to face stigma, discrimination, and social exclusion" (Dharmawan et al 2021 p12).

The review only included studies published in English, which missed research in high leprosy countries like Indonesia and Brazil where work could be published in languages other than English (Dharmawan et al 2021).

Any review depends on the studies found, and there was heterogeneity in these studies, including in definitions and cut-off points for detection delay, research method (eg: nineteen observational studies; two longitudinal studies), data collection settings (eg: hospital; clinic; nationwide), and country (seventeen studies in Asia; eight studies in South America).

Chagas disease is another NTD that can remain asymptomatic for many years. "Therefore, current prevalence of infection or disease does not truly reflect the current transmission trends. For instance, high prevalence potentially reflects a high level of past transmission rather than current exposure" (Ledien et al 2023 p2). Disease control measures are different here compared to an infection with short emergence.

Sero-prevalence surveys (ie: blood tests for anti-bodies) can be used to estimate past trends in exposure, and the rate at which a population became infected (known as "Force-of-Infection") (Ledien et al 2023).

2.6. ONE HEALTH APPROACH

The "One Health" position is defined by the WHO as "an integrated, unifying approach that aims to sustainably balance and optimise the health of people, animals and ecosystems" (quoted in Diaz et al 2023). This means that addressing NTDs goes beyond humans to include environmental and zoonotic characteristics of infection.

One concept is "animal reservoir". This is the idea that infections risky to humans can live (and evolve) in animals with the potential to jump to humans (as in the case of covid-19, probably).

Schistosomiasis can be classed as zoonotic, infecting livestock in Asia, for instance [5], and human behaviours can increase the risk of transmission to humans in new areas. "The increased migration of animals and/or humans in conjunction with man-made ecological change (eg: dam construction, irrigation systems, agriculture and deforestation) will continue altering schistosomes' geographical range, further complicating control efforts" (Diaz et al 2023 p4).

"Interventions to tackle the emerging risk of zoonotic hybrids in Africa include preventing susceptible livestock from coming into contact with contaminated water bodies (eg: by providing drinking water in troughs, contamination of communal water with livestock faeces could be minimised), treatment of infected livestock and limiting interaction with wildlife" (Diaz et al 2023 p5). Praziquantel is a drug for livestock schistosomiasis, but there is always the risk of the evolution of resistant streams of bacteria, as with any MDA (Diaz et al 2023).

2.7. APPENDIX 2A - HEALTH FINANCE

"While the movement to reform health care is not new, the understanding of the health of a population, its determinants and ways to improve it has become far more sophisticated in recent times. Approaches to reform efforts have had to take into account the broader definition of health as a social construct as well as the economic, political and social contexts in which health services are provided" (Giacaman et al 2003 p59). Health service reform has been important around the world since the 1980s, but, in the 21st century, the focus has been on "introducing increasing market mechanisms in health care provision" (Giacaman et al 2003 p59).

Such reforms are even more difficult in the "fragile and conflict-affected setting" (FCAS), particularly as ill health is clearly linked to living in such areas

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[5] Wild rodents have also been found to be infected with Schistosoma mansoni in the Caribbean, Brazil and Africa (Diaz et al 2023).

(Bertone et al 2019). "Beyond health outcomes, health systems strengthening is often hypothesised to also promote peace, state-building and stability through its contribution to making the state more visible and legitimate and able to realise its primary function of service delivery... Motivated by these factors, donors [eg: high-income countries] have shown an increasing interest in investing in health systems in FCAS" (Bertone et al 2019 p209).

Witter (2012) performed a literature review on health financing in the FCAS, which Bertone et al (2019) updated [6]. One hundred and fifteen documents covering thirty FCAS countries (eg: Afghanistan; Haiti; Palestine) were found by the latter researchers. It was noted that "[M]any FCAS rely on external aid to fund healthcare provision" (Bertone et al 2019 p211).

The main types of funding of healthcare included (Bertone et al 2019):

i) Health insurance - Already-existing schemes prior to conflict were more effective than trying to start a new scheme in the FCAS.

ii) Health equity funds - NGOs (non-governmental organisations), for example, identify the poorest and most marginalised in society, and fund their access to care.

iii) Demand-side financing - eg: vouchers and conditional cash transfers.

iv) Contracting-out provision of services to NGOs.

v) Performance-based financing - Health providers are paid based on their success in achieving certain goals.

vi) Taxation-based services - Often difficult because of the reduced economic activity during conflict.

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3. INEQUALITIES

3.1. Heart
3.2. Long-term conditions
3.3. Healthcare generally
3.4. References

3.1. HEART

Aortic valve replacement (AVR) is a common treatment for heart valve disease (aortic stenosis; AS). But AVR is not always provided, and US studies, for example, report ethnic differences in use (eg: Wilson et al 2020).

Rice et al (2023) analysed UK data on AVR for AS to investigate gender, ethnicity, and social deprivation differences. The English Hospital Episode Statistics (HES) recorded over 183 000 adults with AR between April 2016 and March 2019.

It was found that:

i) Women were less likely to receive AVR than men. Blair et al (2011) argued that a "male as default" approach in the healthcare system generally meant unconscious/implicit bias.

ii) Black and South Asian individuals less likely than White individuals.

iii) Individuals from the most deprived areas (ie: poorest) less than from the least deprived areas (ie: richest).

The dataset included all NHS-funded care in England, but, like any such data, depended upon the accuracy of coding and record-keeping by administrative staff.

The study compared the different groups on unidimensional characteristics (eg: male vs female), and was not able to fully show differences based on interactional characteristics (eg: Black male vs White female).

The study only included diagnosed cases and not undiagnosed individuals and/or those who did not seek medical help.

3.2. LONG-TERM CONDITIONS

Long-term health conditions are those that are "currently not curable and can only be managed with medication or other therapies" (Hayanga et al 2023 p1). Many individuals have more than one of these conditions (multiple long-term health conditions; MLTCs). There are ethnic differences in the prevalence of MLTCs.

Hayanga et al (2023) reviewed the literature on this topic in the UK with studies published in English before December 2020 (n = 84). The main source of data was patient records in most cases. Seven studies were particularly relevant with prevalence estimates.

Overall, individuals from minoritised ethnic groups had a higher prevalence of MLTCs than the majority White population. The odds ratio varied, but two-three times more likely for Black individuals and 1.5 to 2.5 time more for South Asians compared to the White population. However, there was heterogeneity in the studies, including two finding opposite results. Table 3.1 gives the details of two of the seven studies classed as good quality in terms of methodology.

STUDY	DATA	ETHNIC CATEGORIES	NUMBER OF MLTCs
Ashworth et al (2019)	Primary care records of over 330 000 adults. Analysis adjusted for age, gender, area-level deprivation, and cardiovascular risk.	5 White Black South Asian Mixed Other	12
Dorrington et al (2022)	Lambeth Datanet (primary care database); over 326 000 working-age adults (16-60 years old). Analysis adjusted for age, gender, and area-level deprivation.	7 White Black African Asian Black Caribbean Mixed Other Black other	13

Table 3.1 – Two good quality studies as examples found by Hayanga et al (2023).

There were a number of key methodological issues with the studies in the review, including:

i) The definition and operationalisation of MLTCs –

eg: the use of "multi-morbidity" ("the presence of two or more long-term health conditions"; p2), and "co-morbidity" ("the presence of any distinct additional co-existing ailment in a person with an index condition under investigation"; Hayanga et al 2023 p3).

ii) Data source - eg: hospital records; primary care records; population surveys. Patient record data miss those who are not in contact with health services.

iii) Control and adjustment in statistical analysis for confounders, including age, sex, and social deprivation.

iv) Ethnic group definition - eg: self-report; researcher-assigned; name recognition software. Also how the missing data on ethnicity was resolved (eg: use residence postcode).

v) Number of ethnic group categories - eg: five broad groups; four or fewer; White vs non-White. Also whether categories with small numbers were excluded from analyses. Hayanga et al (2023) noted two points - the variety within broad groupings (eg: Pakistani and Bangladeshi differ from Indian within the "South Asian" category), and the inclusion of "White other" (eg: Gypsy, Roma and Traveller communities).

vi) The MLTCs and number studied - eg: kidney-related conditions; mental health conditions; diabetes; cardiovascular-related conditions.

vii) Level of data - eg: local community; nationwide.

Hayanga et al (2023) ended: "Given the complexity of multiple conditions, the diversity of the minoritised ethnic group populations in the UK, and the varied pathways through which they come to develop MLTCs, future studies would benefit from conceptualising and analysing the prevalence of ethnic inequalities through an intersectional lens" (p20).

3.3. HEALTHCARE GENERALLY

Hamed et al (2022) investigated "how racism is discussed and produced in the process of delivering, accessing and receiving healthcare" (p1). The search terms "racism", "racial", "racialization"/ "racialisation", "racial bias", "discrimination", "structural racism", "structural discrimination", "institutional discrimination", "institutional racism" were used in four major English language electronic databases ("PubMed", "PsycInfo", "ASSIA", and "Scopus"). Overall, 213 relevant peer-reviewed articles were found.

The findings were summarised under the following headings:

i) Racialised minority [7] healthcare users' experiences of racism in healthcare (117 articles) - "Racialised minority healthcare users report being subjected to both overt and covert racism in healthcare interactions from healthcare staff in a number of studies" (Hamed et al 2022 p7). This was manifest in different ways, including negative assumptions from healthcare staff, behaviours like rudeness, lack of respect, and apathy from staff, and exclusion from decision making about treatment. In some cases, this led to racialised minorities avoiding seeking healthcare, as well as issues of trust of staff when treatment sought.

ii) Racialised minority healthcare staff's experiences of racism in their workplace (27 articles) - Incidents of racism by other staff members were reported, as well as bullying, and lack of trust.

iii) Healthcare staff's racial attitudes and beliefs (33 studies) - A "tendency to homogenise racialised minorities" (Hamed et al 2022 p10) (ie: view all individuals from the same group as the same), and evidence of implicit racial bias in favour of Whites (particularly in US studies) and Europeans (in New Zealand, for instance).

iv) Effects of racism in healthcare on treatment choices (14 articles) - Differences in treatment found (eg: less use of pain relief for Black than White patients in US studies). However, at least one study found no differential treatment.

v) Healthcare staff's reflections on racism in healthcare (15 articles) - Healthcare staff "tend to

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[7] Hamed et al (2022) explained: "We use the term racialised minority to specify groups of people who are numerically a minority but who are also racialised as inferior in comparison to the majority groups and are thus subject to differential and unequal power relations and treatment in various institutional contexts. Although, we use the term racialised minority and majority..., the reviewed articles used a variety of different terminologies to indicate different ethnic groups" (p3).

construct themselves as neutral and impartial and have difficulty in accepting that prejudice is part of healthcare interactions", and "generally frame medicine as rational, neutral and based on objectivity and that racism is seen as a matter of individual experiences rather than structural" (Hamed et al 2022 p11).

vi) Anti-racism training in healthcare (15 articles) - Some evidence of positive changes among healthcare staff who received such training. However, "one study [Chapman et al 2018] shows that implicit racial bias pre- and post-intervention remains significantly unchanged, which is to be expected if racism is understood as an outcome of historical processes and deeply embedded in social institutions" (Hamed et al 2022 p14).

Hamed et al (2022) summed up: "Healthcare and national contexts notwithstanding, various racialised minorities seem to share commonalities in the way they experience racism..., especially regarding the more covert type of racism" (p12).

The majority of studies came from the USA (67%), followed by the UK and Canada (7%), but few from Europe as a whole. "The domination of data from the USA may be explained by the availability of racial category data in the USA. In the USA, 'race' is a legal category, enabling data to be readily available for research, which is not the case in many European countries" (Hamed et al 2022 p13).

There were differences between studies in the definition and conceptualisation of racism, "race", and ethnicity, as well as "a general lack of attention to and illustration of the historical context within which these racial categories have been formulated. Put in other words, research tends to study 'race' instead of looking at racialisation processes and the resulting racism that subsequently constructs an idea of 'race'" (Hamed et al 2022 p13). Using Miles's (1989) idea of the historical context of "race" categories, Hamed et al (2022) stated: "When 'race' is invoked in a non-critical and ahistorical manner, there is a risk of producing racial categories as fixed and unchanging biological classifications instead of the unstable social constructs that they are" (pp13-14).

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4. MISCELLANEOUS CANCER

4.1. Long life and cancer risk
4.2. Global cancer rates
4.3. Sun safe behaviour
4.4. References

4.1. LONG LIFE AND CANCER RISK

"A major constraint on the evolution of long lifespans is an increased risk of developing cancer because organisms with long lifespans have more time to accumulate cancer-causing mutations than organisms with shorter lifespans" (Vazquez et al 2022 p2). But, at the same time, offspring of longer lived parents have a lower incidence of cancer than offspring of shorter lived parents. "There is no correlation, however, between maximum lifespan and cancer risk across species... – this lack of correlation is often referred to as 'Peto's Paradox' (Peto et al 1975...)" (Vazquez et al 2022 p3).

Tumour suppressor genes would be one way to evolve longer lifespans. Vazquez et al (2022) used the example of the Bowhead whale (Balaena mysticetus), which can live over 200 years. cancer prevalence in cetaceans generally is low - around 1.5%, Vazquez et al (2022) calculated from published studies. But the data came from post-mortem studies, of which there were a limited number. However, "these data indicate that whales must have evolved enhanced cancer suppression mechanisms to reduce their cancer risk because in aggregate cancer is relatively rare in cetaceans" (Vazquez et al 2022 p10).

4.2. GLOBAL CANCER RATES

Globally, lung cancer is the main cause of cancer death, though breast cancer has the largest number of new cases per year (Zhao et al 2023). "Cancer is generally more prevalent in adults over 50 years, but the incidence of early-onset cancer (<50 years) has increased worldwide" (Zhao et al 2023 p1) [8].

Zhao et al (2023) analysed data from the "Global Burden of Disease (GBD) 2019" for twenty-nine early-onset cancers in 204 countries and regions. Early-onset cancer was defined as diagnosed between fourteen and 49 years

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[8] Bowel cancer is showing the steepest recent increase in under 50s (eg: a 50% increase in 25-49 year-olds in the UK since the 1990s) (Wilson 2023).

old. A comparison was made with 1990.

The incidence (ie: new cases) of early-onset cancer increased globally by 79% in the study period, and deaths by 28%. The increase was greater in richer countries.

Possible explanations included the "Western diet" (eg: high in red meat, low in fruits, high in sodium, and low in milk) and lifestyle factors (eg: tobacco and alcohol use; physical inactivity) (ie: a real increase), or earlier detection and better screening (ie: not a real increase). The reasons for the increase will vary, to some degree, depending on the specific cancer. Zhao et al (2023) gave this example: "the change of reproductive factors (younger age at menarche, oral contraceptive use, nulliparity, older age at first birth and never breast feeding), physical indicators (higher BMI [body mass index]) and behaviour factors (physical inactivity and alcohol consumption) during recent decades may have contributed to the increasing incidence of early-onset breast cancer" (p8).

The GBD data are based on submissions by individual countries and regions, and the quality varies. "Thus, the under-reporting and under-diagnosis in undeveloped countries may result in underestimation of the incidences and deaths of early-onset cancer" (Zhao et al 2023 p10). The choice of 50 years of age as a cut-off is an arbitrary decision, though it is an agreed boundary between early- and late-onset cancer. Establishing the cause(s) of the increase in cases is difficult. Hamilton and Coleman (2023) commented: "Full understanding of the reasons driving the observed trends remains elusive, although lifestyle factors are likely contributing, and novel areas of research such as anti-biotic usage, the gut microbiome, outdoor air pollution and early life exposures are being explored" (p1).

They continued later: "While most cases of early-onset cancer appear to be sporadic, the role of hereditary syndromes needs to be better quantified. Identifying inherited cases via germline testing is important and has implications for cancer management and surveillance, both for the affected patient and their family members. A major research gap is our limited understanding of the molecular pathogenesis of sporadic early-onset cancers, and whether certain subtypes are driving the increasing incidence" (Hamilton and Coleman 2023 p2).

The increase in early-onset cancers, Hamilton and Coleman (2023) saw as the changing "epidemiological landscape of cancer incidence", though "increasing age remains a major non-modifiable risk factor for cancer" (p1).

Two implications from Zhao et al's (2023) study are the future burden on healthcare systems if the trends continue (particularly in low- and middle-income countries with disproportionately high death rates), and the need to apply early detection/screening measures to younger age groups (eg: 40-49 years old) (Hamilton and Coleman 2023).

4.3. SUN SAFE BEHAVIOUR

Health messages can be adapted to individuals rather than using the same material for everyone. This is "message tailoring", defined as "the personalisation of information based on user characteristics" (Jensen et al 2014 quoted in Jensen et al 2023). Such messages have been found to "produce a small but statistically significant persuasive advantage compared with stock messages" (Jensen et al 2023 p6).

At a general level, Jensen et al (2012) adapted breast cancer pamphlets based on age, ethnicity, and risk. While at a personal level, Blashill et al (2018) tailored photographs of the participants with age progression software to discourage tanning salon use.

Ultra-violet (UV) photographs can reveal changes that are not normally visible (ie: "sun damage"), and so may be useful in encouraging "sun safe behaviour". Jensen et al (2023) reported the use of UV photographs in a large experiment in Utah high schools in the USA. Over 600 14-18 year-olds took part in this one-month longitudinal study. There were four groups, and all received a lecture on sun safe behaviour, and skin cancer risk. The control group (education-only condition) received no other information. The other three groups either received a personalised UV photograph (tailored UV condition), information on how to perform sun safe behaviour (implementation condition), or a sunscreen application task (sunscreen efficacy condition). All three groups received a stock UV photograph as well. The outcome measure related to outdoor tanning frequency in the past month (ie: for a period of fifteen minutes of more). This was measured before the experiment, and one month later.

Tanning frequency dropped between the baseline and one-month post-experiment in the whole experiment (mean 2.17 to 2.09 out of 5). The frequency decreased significantly in the tailored UV condition (mean 1.83

post-experiment) compared to the other conditions. The implementation and sunscreen efficacy conditions showed a reduction in frequency of outdoor tanning compared to the control group. This study confirmed the usefulness of UV images to encourage sun safe behaviour, and, in particular, personalised UV photographs.

The mechanisms of change appeared to be increased fear of skin cancer, and decreased appearance-based perceptions of tanning. The participants in the tailored UV condition were less likely to agree with the statement, "I look better with a suntan" immediately after the experiment.

The measures were self-reported, and though the study had a longitudinal design, it only lasted one month.

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5. DATA-DRIVEN HEALTH

- 5.1. Self-tracking
- 5.2. Environmental impact
- 5.3. Appendix 5A - Information and communication technology
    - 5.3.1. Rebound effect
- 5.4. References

5.1. SELF-TRACKING

Sharon (2017) began: "In less than a decade, a steady stream of new smartphone applications and wearable mobile sensors that allow users to monitor sleep, food intake, exercise, blood sugar, mood, and a host of other physiological states and behaviours has permeated the consumer health landscape, bearing the promise of cheaper, better, and more efficient healthcare. Self-tracking devices point to a future in which individuals will be more involved in the management of their own health and will generate health information that will benefit clinical decision making and research" (p94). This fits with the idea of "personalised healthcare" (PHC), with the emphasis on data (data-centredness, as well as "mobile health" (m-Health)), and on the individual (patient- or citizen-centred) (Sharon 2017).

The process of personal data capture from wearables and smartphones, for example, has been called "digital phenotyping", and was defined as "moment-by-moment quantification of the individual-level human phenotype in situ using data from digital devices" by Torous et al (2016; quoted in Spinazze et al 2019). Spinazze et al (2019) felt this definition was too broad, and so proposed a definition of "digital phenotyping as the process of inferring individual behaviour from digital data generated through human interaction with electronic devices, including both physical hardware and software. This data can be both: (1) active, wherein the individual is required to perform a task or act to capture this data, for example, complete a survey or (2) passive, wherein there is no action or requirement of the individual outside that of normal daily activity or behaviour" (p1).

Self-tracking is enthusiastically embraced by what has been called the "Quantified Self community" [9];

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[9] "The Quantified Self was founded in 2007 by Gary Wolf and Kevin Kelly, two editors of Wired magazine, who felt that the rise of self-tracking in their San Francisco environment deserved a website and a place where enthusiasts could meet, share their self-tracking experiences, and discuss their

individuals who wear sensors and use smartphone apps that "allow users to collect, measure, and display data concerning virtually any form of bodily function and behavioural activity" (Sharon 2017 p95). The data are usually uploaded to related websites and social media platforms for sharing and comparison with others, and with the gamification aspect of rewards to maintain motivation. However, there are critics, and Sharon (2017) outlined three broad, polarised debates about self-tracking:

i) Empowerment (pro) vs surveillance and discipline (anti) - Sharon (2017) observed that "very much in line with the hype of PHC, what is seen as revolutionary with the advent of mobile health is not just the type of medicine and care that will be made possible (more targeted, more preventive), but that it will allow ordinary people to take more control over their health" (p97). Topol (2015) talked of the "democratisation" of medicine, while Swan (2009) wrote that the role of the patient is changing "from being a minimally informed advice recipient to an active participant, instigating collaborator, information sharer, peer leader and self-tracker engaged in participative medicine; a transition is underway from paternalistic health care to partnership models" (quoted in Sharon 2017). Advertising for tracking devices and apps tend to emphasise the empowerment aspect (eg: "take control of your sleep"; "eat smarter") (Sharon 2017).

The critics emphasise the negative aspects of self-tracking data collection. "Mobile wireless devices that can collect biometric data anywhere and anytime and communicate it automatically to medical professionals wirelessly seem to offer an unprecedented opportunity on the part of public health officials to monitor and discipline people's health and lifestyle behaviours, not just of patients', but, in the aim of prevention, also those of healthy individuals" (Sharon 2017 p98). Lupton (2012) described the self-tracking devices as part of the "net of surveillance" that is "encouraging users to turn the medical gaze upon themselves in the form of 'self-surveillance' and to invite peers to participate in monitoring practices via the sharing of personal data on social media and other digital platforms. In addition, the 'gamification' of self-tracking for health on these platforms, where self-trackers can compare their data against others', inviting ever further scrutiny, is perceived as leading to a greater normalisation of

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findings" (Sharon 2017 p103).

intrusive surveillance practices" (Sharon 2017 p98).

ii) Improving individual health (pro) vs the disintegration of collective responsibility for health (anti) - PHC offers the opportunity of better health for individuals who collect their data and respond to their evidence. This is "Me Medicine" as opposed to "We Medicine" (Dickenson 2013) (with the ideals of common good and public health). "What the individualistic approach to health does in this view is detach health from its broader social, political, and cultural dimensions, directing collective attention away from health threats posed by social or environmental conditions... Furthermore, when health is construed as a choice, those who do not, or cannot, 'choose' health can be blamed for poor health, in forms ranging from public disdain and stigmatisation for adding to the 'burden' placed on the public health system, to penalisations or a withholding of treatments based on 'lifestyle rationing'" (Sharon 2017 pp101-102).

iii) Greater (self-)knowledge (pro) vs the reductionism of numbers (anti) - More data must mean more knowledge about the individual and health. Critics challenge the excessive value and trust placed on numbers by the "Quantified Self community" (motto: "self-knowledge through numbers"; Sharon 2017), and point out that it is a reductionist process. "Self-tracking works on the basis of categories or indicators that act as proxies for what are commonly very messy and rich phenomena, from 'mood' to 'health' to 'productivity'. When devices are described as giving users a 'dashboard' or a 'perfect picture' of their health, these data have a tendency to come to denote what health is. Similarly, explain critics, the relationship of variables commonly tracked in diet apps to weight gain and weight loss, and to health in general, is not something that can be reduced to a simple algorithm" (Sharon 2017 p104).

Sharon (2017) wanted to take a middle path in the polarised debate. The arguments are often the "extremists" - absolute supporters or critics - and the practice of "ordinary" people is not the same. For example, more data can help population health as a whole, but numbers should not be embraced uncritically. Sharon (2017) ended with these questions: "which self-tracking practices, in the context of different groups of practitioners, will enable enactments of values in such a way that they overcome both the promises and concerns in the debate on self-tracking and PHC? What kinds of practices, and under what conditions, will help secure the values of autonomy, solidarity, and authenticity in ways that are meaningful to individuals and collectives in the new networks of human actors, self-tracking technologies, and diverse expectations from and by citizens and patients that are taking shape?" (p117).

5.2. ENVIRONMENTAL IMPACT

The vast amount of data related to health is changing the health research landscape. There are "Data-Driven and Artificial Intelligence" (DDAI) technologies "with capabilities to store and process vast quantities of clinical data, and new collections of health data from non-traditional sources... These in turn have led to the explosion of health data repositories, containing troves of clinical and genomic data, as well as swaths of self-tracking data from wearables, biosensors and/or environmental data. Meanwhile, social media and other data are being mined for health research, and machine learning techniques are being used to help predict health conditions" (Samuel and Lucassen 2022 p1).

The expansion of DDAI technologies has an adverse environmental impact (eg: carbon dioxide from energy generated to power them; extraction of minerals for technology components [10]; e-waste; building of large data centres) (Samuel and Lucassen 2022) [11]. Scott et al (2012) distinguished between "upstream impacts" (eg: raw material extraction), "mid-stream impacts" (eg: use of DDAI technologies), and "downstream impacts" (eg: e-waste) (appendix 5A).

Focusing on this topic, and specifically in the UK, Samuel and Lucassen (2022) performed a literature review in October 2021, and found nineteen relevant articles. A number of themes were extracted from the articles, including:

a) A realisation of the energy use and the need to reduce it.

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[10] "Mining and minerals extraction has been shown in many different jurisdictions to impact on worker and community health: risks to workers include respiratory illness, injuries, cancers, and mental health; community health risk occur through exposure to air water, soil and noise pollution as well as disasters, and indirectly through migration including the transmission of communicable diseases such as HIV AIDS and the Ebola virus" (Harris et al 2015 p1045).

[11] It has been estimated that the environmental impact of global healthcare activities, including research, make up around 5% of total world carbon emissions (Samuel and Richie 2023). Specifically, nearly 350 000 registered clinical trials have an estimated 27.5 million tonnes of carbon emission (Adshead et al 2021).

b) Developing technological solutions - eg: more energy efficient "cloud computing" approaches.

c) Non-technological solutions - "Few articles considered the amount and/or type of data collection and processing as factors associated with the unintended environmental impacts of DDAI technologies in the health sector" (Samuel and Lucassen 2022 pp5-6).

d) Sustainability - Half the articles considered this issue (eg: "green IT" [information technology]).

Specifically on this issue, Samuel and Lucassen (2022) undertook a web search for relevant policies and initiatives. Most of these related to energy reduction and e-waste, but little about "the unintended environmental consequences associated with DDAI technologies specifically" (Samuel and Lucassen 2022 p6).

The overall conclusion of Samuel and Lucassen (2022) was "relatively little engagement" with the environmental impacts of DDAI technologies in the academic literature. "This might be because most efforts to address the environmental sustainability of DDAI technologies are seen to be an issue for the computing sector rather than as a concern for those who use computational and IT technologies. It might also be because of current difficulties with calculating the exact environmental impacts of DDAI technologies" (Samuel and Lucassen 2022 p7).

The researchers commented more generally on the drive to collect more and more data. This requires "being attentive to not only the associated potential benefits of these practices, but also reflecting on the economic and political drivers of this 'datafication' [Ruckenstein and Schull 2017] culture (what are the assumptions that drive us to collect and analyse this data, and where do these assumptions come from), as well as any potential harms that may come from such a culture (including addressing the commonly held misperception that digital technologies do not have an unintended environmental impact). Underlying the 'more data is better' culture is the underlying assumption that individuals can be completely knowable if enough data is collected and analysed" (Samuel and Lucassen 2022 p7).

Lannelongue et al (2021) proposed ten rules about environmental sustainability for health researchers and their use of DDAI technologies. "These include calculating the carbon footprint of their research and including this in a cost-benefit analysis; choosing a computing facility and any associated hardware carefully; increasing the efficiency of the code used to analyse the data; and being a frugal analyst during this process (pilot energy-hungry algorithms on smaller data sets first). They also remind researchers to be aware of rebound effects, that is, such as that increases in IT efficiency will lead to increases in demand for data storage and analyses, not a reduction. Taking these rules on board takes seriously the concept of 'digital temperance' [Chevance et al 2020] - it forces us to slow down and think carefully about the specific data we need to collect for our research (rather than collecting as much as possible), and give due consideration to how this data is stored and analysed..." (Samuel and Lucassen 2022 p8).

Samuel and Richie (2023) argued that research ethics should include an awareness of environmental sustainability as well as the usual concern for the protection, rights, safety, and well-being of participants.

"Biomedical ethics" or bioethics tend to focus on the individual (eg: respect for autonomy), but "an increasing number of scholars have advocated bioethics readopt a broader perspective that aims to explore the relationships between individuals and the natural environment. They reject that the land and ecosystems are just instrumentally valuable — good because of how humans can use them — but rather argue that our moral sentiments need to extend to the biotic community, to the soils, waters, plants and animals that make up our planet since nature is both inherently valuable — good in itself — and because humans are a part of, not separate from, nature" (Samuel and Richie 2023 p429). This is a "systems approach" which emphasises the interconnectedness of individuals and the environment.

Richie (2019) proposed four normative principles to a "green bioethics framework": "distributive justice takes a broad view of the moral community and requires the allocation of basic medical resources before special interest access; resource conservation to provide healthcare needs before healthcare wants; simplicity to reduce dependence on medical interventions; and ethical economics to promote humanistic healthcare instead of financial profit" (Samuel and Richie 2023 p429). Samuel and Richie (2023) developed the idea of restraint, and justice with five ethical principles for health research:

i) Scientific quality - Methodologically rigorous research that is aware of wastage of resources.

ii) Social value - Research should be beneficial to the individual and society, and the environment. Any harm to the environment should be fully justified as with harm to individuals.

iii) Respect for persons, communities, and environment - eg: the harvesting of medicinal plants in a rainforest - is it justified?

iv) Justice - eg: clinical trials in the developing world that many not directly benefit that part of the world - justifiable?

v) Favourable risk to benefit ratio - Any risk/benefit assessment must include environment-related risks (table 5.1).

- Scientific quality - "Data should not be collected and analysed without ensuring that the research outputs will be of sufficient quality (considering issues of bias etc). The storage and processing of data are not harm-free and should only be collected and/or analysed if there is an appropriate reason for doing so, such as translatability to significant medical progress, deep gains in knowledge, and the potential for widespread and just dissemination of any developments" (Samuel and Richie 2023 p431).

- Social value - eg: low-tech and preventive medicine may have greater value than high-tech, reactive solutions.

- Respect for persons, communities, and environment - eg: "optimising algorithms to ensure they have as minimal impact on resource use and carbon emissions or choosing data centres with considerations of sustainability in mind (eg: if the energy they use to power them is 'dirty' or 'clean', non-renewable or renewable)" (Samuel and Richie 2023 p431).

- Justice - The fair collection, storage, use, and sharing of data with equity in mind.

- Favourable risk to benefit ratio - "This can be achieved by, for example, buying repurposed machines where possible, using data centres that are powered by renewables and having appropriate recycling infrastructures for digital technologies" (Samuel and Richie 2023 p431).

Table 5.1 - Samuel and Richie's (2023) principles of research ethics and data driven health research.

Samuel and Richie (2023) ended: "As the levels of atmospheric carbon are already over safe levels of 350 parts per million, research must be done parsimoniously in ways that neither suppress scientific invention and creative nor threaten the health of people and the planet" (p432).

5.3. APPENDIX 5A - INFORMATION AND COMMUNICATION TECHNOLOGY

Estimates of the environmental impact of the Information and Communication Technology (ICT) sector as a whole are 2-3% of global greenhouse gas (GHG) emissions in 2020 (Freitag et al 2021).

Estimates vary in their inclusion of "embodied emissions" (the GHG emissions from the extraction of raw materials for the products, and their manufacture and transportation to the user), "operational emissions" (ie: energy use and maintenance), and "end-of-life emissions" (ie: disposal after use). For example, the "carbon footprint" from embodied omissions vary between 25-50% of total emissions, depending on the study, and the product (Freitag et al 2021).

At one end of the scale are data centres that require large amounts of energy all the time (and embodied emissions are a smaller part of the total emissions), though to consumer electronics that are turned on and used sometimes (and embodied emissions will be a larger part of the total).

Freitag et al (2021) found peer-reviewed estimates of environmental impact of the ICT sector from three main research groups. All agreed that data traffic will continue to grow, and so demand more energy. The switch to renewable sources of that energy is crucial. There was disagreement between the studies over energy efficiencies in ICT and their effectiveness in reducing emissions. For example, data centres and better cooling technology, or efficiencies of scale from being larger, or using AI to optimise energy use. There are limits, however, to any improvements (Freitag et al 2021).

A separate problem is consumer behaviour. For example, the use of a wider range of products, like smart watches and smart speakers in addition to smartphones and laptops. "Multiple user devices in the home have also led to a third of UK households watching separate video content simultaneously in the same room once a week where people may have watched content using the same TV before" (Freitag et al 2021 p6).

Freitag et al (2021) suggested that demand for ICT products and services will outstrip any energy efficiency gains. This can be seen in the growth of the "Internet of Things" (IoT) and in blockchain technology use (table 5.2).

	THREAT	OPPORTUNITY
Internet of Things ("a set of everyday internet-connected objects from wearable technologies through to appliances, cars, and other transport vehicles"; Freitag et al 2021 p10).	Increased number of devices, and consequently data traffic.	Efficiency gains from the connectedness of devices.
Blockchain ("a decentralised algorithm designed to avoid a centralised authority or centre point of failure"; Freitag et al 2021 p11).	Very high energy consumption.	No emission-reducing applications yet, and/or "speculative at this stage" (Freitag et al 2021 p11).

Table 5.2 - Environmental threats and opportunities of two ICT developments.

Freitag et al (2021) ended: "Looking to the future, our concerns are that this growth in emissions will continue at a time when emissions must shrink. All analyses reviewed... concur that ICT is not on a path to reduce emissions in line with recommendations from climate science unless additional steps are taken by the sector, or legislators, to ensure that this happens. Prevalent policy emphasis on efficiency improvements, use of renewables and circular electronics is likely insufficient to reverse ICTs growth in emissions" (p15).

5.3.1. Rebound Effect

It has been observed that improvements in energy efficiency are "often frustrated owing to the rebound effect. These rebound effects occur when an increase in resource and energy efficiency is offset by adverse behavioural responses, leading to increased consumption rather than decreased consumption" (Segovia-Martin et al 2023 pp1-2). The term "Jevons Paradox" (Jevons 1866 quoted in Segovia-Martin et al 2023) has been used for this.

Technically, a rebound effect is a return to the original (or similar) position (eg: a 10% increase in energy efficiency and a 10% rise in demand for energy), but there is also "backfire effects", where the actual consumption increases (eg: a 10% increase in energy efficiency and a 20% increase in energy consumption) (Segovia-Martin et al 2023).

Rebound effects may be direct or indirect. "A direct rebound effect occurs when an increase in the efficiency of energy service provision leads to an increase in the demand for such a service by consumers. For example, when a household replaces their less energy-efficient boiler with a more energy-efficient one, they may enjoy lower heating costs and consequently choose to maintain a higher room temperature, leading to a direct rebound effect. By contrast, an indirect rebound effect occurs when consumers react to an energy efficiency improvement or a sufficiency-related behavioural change by increasing consumption in another area. For instance, they may use the cost savings from a new, more energy-efficient boiler to fund a holiday abroad, which, in turn, generates increased emissions" (Segovia-Martin et al 2023 p2).

There is great variety in the estimates of rebound (and backfire) effects, depending on the area of society studied (eg: 45-123% in food and heating; 4-24% in transport and lighting; 7-300% in food, travel and utilities) (Segovia-Martin et al 2023).

Segovia-Martin et al (2023) argued that the rebound (and backfire) effects are often ignored in predictions of future GHG emissions. "Surprisingly, policy makers remain relatively unaware of these issues, with governments, green-focused political parties, and non-governmental organisations tending to believe that efficiency gains lower consumption and thus mitigate deleterious environmental impacts" (Segovia-Martin et al 2023 p2).

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6. MISCELLANEOUS

6.1. Cardiac rehabilitation
6.2. Career intentions of UK medical students
6.3. Sleep and ostensibly paranormal experiences

6.1. CARDIAC REHABILITATION

Exercise is important as part of rehabilitation for coronary artery disease (CAD). "However, current guidelines for CAD vary considerably, most notably in terms of exercise intensity" (McGregor et al 2023 p746). For example, in the UK less intense exercise is recommended compared to in North America and other parts of Europe (McGregor et al 2023).

High-intensity interval training (HIIT) involves bursts of vigorous exercise (at 85% VO_2peak [12]) and periods of recovery (eg: one minute and one minute). The alternative is moderate-intensity steady-state (MISS) exercise (at <80% VO_2peak). McGregor et al (2023) performed a randomised controlled trial comparing these two types of exercise in CAD rehabilitation.

Six UK sites (outpatient cardiac rehabilitation (CR) centres) recruited 382 participants for the eight-week trial between July 2016 and March 2020. Participants were randomly allocated to HIIT (10 x one-minute cycling and one-minute rest) or MISS (20 minutes continuous cycling). The main outcome measured was change in cardio-respiratory fitness (VO_2peak), while secondary outcomes included reduced CAD risk, and improved health-related quality of life. One year follow-up was also performed.

At week 8, VO_2peak had improved more with HIIT than MISS (statistically significant at eight weeks, but not one year), with no serious adverse effects overall.

The study was blinded by using CR staff who did not know the research aims, but data were missing (for nearly 100 participants at week 8 and nearly 200 at one year) due to part of the trial occurring during the covid-19 pandemic. The participants were mostly White males (nearly 90% of sample).

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[12] VO_2peak is a measurement of maximal oxygen consumption.

6.2. CAREER INTENTIONS OF UK MEDICAL STUDENTS

Full medical training is a costly investment, and the career behaviour of the doctors in the future is important. For example, career intentions to leave the profession or work in another country. In the UK, there is concern over a shortage of doctors. "Recently, there have been proposals to double the number of medical school places as a solution to address the shortage of doctors in the NHS [National Health Service]. However, without addressing the issue of doctors leaving the NHS, increasing the number of medical students is unlikely to provide a sustainable long-term solution. Recruitment efforts may be ineffective if the retention of doctors is not simultaneously addressed" (Ferreira et al 2023 p2).

The AIMS (Ascertaining the career Intentions of UK Medical Students) Study was undertaken to understand these issues. Over 10 500 medical students at forty-four UK medical schools completed the seventy-one item specially designed questionnaire. This was a response rate of a quarter of all medical students in early 2023.

After medical school, graduates enter a two-year Foundation Programme (FP) to sample various specialities and clinical settings for four- to six-month periods. The majority of respondents (84%) intended to complete the FP. The remainder divided into (i) complete one year of FP and emigrate to practice medicine (EPM) (11% of total students), or leave profession (1%); (ii) leave profession immediately on graduation (1%), or EPM (2%); and (iii) take a break or study a postgraduate course (1%). Of the majority completing the FP, around one-quarter were intending to EPM. So, in total, nearly one-third of the sample reported the intention to EPM at some point in the future, of which half said they would return to UK medicine later.

Asked about perceptions of work as a doctor, most dissatisfaction was voiced about working conditions in the NHS, remuneration at junior level, and work-life balance from a choice of fourteen options.

How do the findings compare to other countries? Most studies focus on developing countries, like Chaet et al (2021), who found that half of medical students at one university in Madagascar and one-quarter at a Tanzanian university intended to EPM. Ferriera et al (2023) noted: "It is interesting that the observed trends in these low-income and middle-income countries align with those in the UK, despite the ...[UK's] significantly larger economy" (p8).

Ferreira et al (2023) collected data at one point in time, and intentions can change as well as actual behaviour (eg: emigration and return). The researchers pointed out that "the questions in our survey instruct students to be definitive even when they might not yet have an idea of their career plans, particularly for those in the younger years of medical school. For purposes of brevity and mitigation of survey fatigue, the survey did not provide exhaustive response options. As a result, some decision-making factors may have been omitted. To address this, a free-entry text box was available for participants to supplement their answers. Finally, it should be emphasised that the respondents were medical students who may have limited knowledge of the realities of working in the NHS. Their current reported perceptions may change once they begin their careers in the NHS" (Ferreira et al 2023 p9).

The response rate was quite low, and the researchers admitted: "we cannot exclude the possibility of selection bias, both from students not seeing the study invitation and others electing not to participate. It may be that this survey appealed to those already intending to leave the NHS or who were interested in the topic" (Ferreira et al 2023 p9). Two-thirds of the sample were female.

References

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6.3. SLEEP AND OSTENSIBLY PARANORMAL EXPERIENCES

Rauf et al (2023) began: "Night-time is a period of great significance for many people who report paranormal experiences. Individuals have previously reported seeing ghosts, demons, ghouls and other grotesque creatures during the night... People have also reported being unable to move or speak, and strange sensations of presence in the room" (p798). Such experiences are associated with different aspects of sleep. These researchers reviewed the evidence of the association between "ostensibly paranormal experiences, paranormal beliefs" (OPEPB), and sleep variables.

What have been described as paranormal experiences are "likely attributable to parasomnias" (Rauf et al 2023 p798). These are sleep disorders and abnormal behaviours during sleep, and they occur during transitions in and out of sleep, and between types of sleep (rapid-eye movement; REM; and non-REM). For example, "sleep paralysis" is "a temporary inability to move that many occur at sleep onset or upon awakening", and is the "admixture of wakefulness and REM sleep" (Rauf et al 2023 p798). Another is "exploding head syndrome" (EHS), which is "a phenomenon characterised by sudden, loud imagined noise or explosion-like sensations in the head as the individual is drifting off to sleep or upon awakening... Although the cause of EHS remains unclear, one theory suggests that the 'bang' is likely to be caused by neuronal dysfunction in the brainstem during the transition from wakefulness to sleep" (Rauf et al 2023 p798).

Rauf et al (2023) found forty-four relevant peer-reviewed studies published in English between 1982 and 2021. "Overall, there were positive associations between many sleep variables (including sleep paralysis, lucid dreams, nightmares, and hypnagogic hallucinations) and ostensibly paranormal experiences and paranormal beliefs (including those of ghosts, spirits, and near-death experiences)" (Rauf et al 2023 p797).

Looking at the parasomnias and sleep variables individually:

i) Sleep paralysis - Sufferers here were more likely to report "ghost oppression", out-of-body experiences (OBEs), and alien abductions.

ii) Lucid dreams (ie: the individual is able to "control" the content of the dream) - A significant positive correlation with OBEs overall.

iii) Nightmares - A positive association with OPEPB (eg: evil spirits; soul dislocation).

iv) Hypnagogic hallucinations (ie: just before falling asleep) - Some mixed findings, but generally a positive association with OPEPB.

v) Sleep quality - Only two studies were found, and they had contradictory results in terms of the association between sleep quality and OPEPB.

vi) Dreams - A common belief that dreams of deceased relatives are visitations.

vii) EHS - A small number of people believed that EHS was "something supernatural" (Sharpless et al 2020 quoted in Rauf et al 2023).

viii) REM sleep variables - eg: "REM intrusion" (ie: going into REM sleep in the non-REM sleep phase) and the reporting of near-death experiences.

ix) Sleep onset and duration - Mixed findings.

x) Sleep apnea - For example, one study (Young et al 2013) found a relationship between the frequency of breathing pauses and excessive daytime sleepiness, and "dab tsog" (Hmong (south-west China) word for evil spirit).

xi) Sleep terrors and sleepwalking - Higher paranormal experiences among individuals showing these sleep behaviours.

Note that the findings were associations (or correlations) between aspects of sleep and OPEPB. This means that causation could be in either direction - ie: parasomnias causing the paranormal experience, or belief in the paranormal leading to the attribution of sleep variables as paranormal experiences.

The studies involved different sample, and positive associations were found particularly with groups that had experienced adversity (eg: refugees), and students. This suggests the possibility that "stressful life experiences could play a role in the association between sleep and the paranormal" (Rauf et al 2023 p812).

Many studies had very small samples, and there were differences in the measurement of sleep and paranormal variables. All studies were cross-sectional in design (Rauf et al 2023).

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