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Scientific Writing

Richard Lilford, ARC WM Director

The ARC WM Director spends a lot of time writing; grant requests, research papers, reports and, yes, your News Blog. My work is submitted to collaborators and reviewers, while I spend a lot of time reading and reviewing grants and research papers.

So a large part of my job concerns the written word. Writing well is not easy: I find writing hard after 40 years of academic work. Perhaps there are two things that an academic needs: good ideas and the ability to convey these ideas in the written word. Instructions for people making grant applications stress the importance of a clear and compelling narrative. The text must be easy to understand and follow. But what makes for clear English? I think there are two different aspects; the words used and the order, or flow, of the words.

Of these two dimensions, the words themselves and the way they are strung together, the latter strikes me as far more important. The words need to create a clear and compelling narrative; you need to tell a good story. Telling a good story turns on putting the thoughts down in the right order, including all the important ideas, and not digressing into issues that do not contribute to the storyline. It might sound odd for a scientist to draw a lesson from a nursery rhyme but I often use 'Little Red Riding Hood' as an example. Everything that is needed to create suspense and provide meaning is included in the tale, while there is nothing included that does not need to be there. For all we know, Red Riding Hood might have met a hedgehog on her way to Granny's house – it does not contribute to the story line; leave it out.

Good writing reflects good thinking. Writing is like painting – an iterative process where a general idea takes form and is crystallised into a meaningful set of objects; ideas in the case of writing, brush strokes in the case of painting. Writing is the act of generating material and organising it in a coherent way.

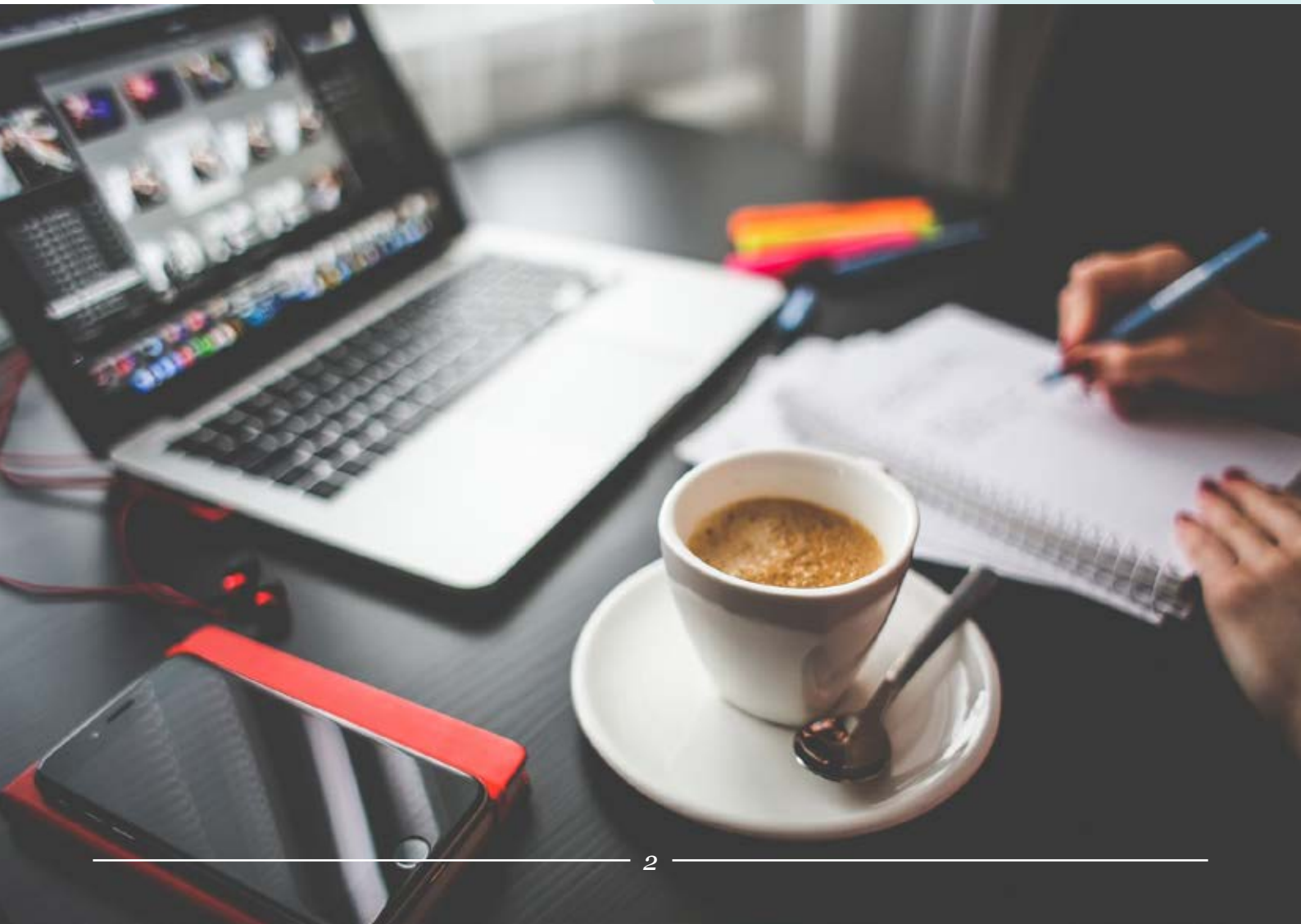
One of my enduring frustrations concerns the way modern grant applications break up the storyline with their endless boxes to be completed; the people that produce these forms clearly do not read them in a cogent way. Take the application form on which I am currently engaged. It places the section '*Why is this research needed now?*' - in other words the 'background' - after the '*research design and methods*' section. It takes only a little thought to spot that the research designs turns on the study question, which in turn turns on '*why the research is needed now*.' As for this current fashion for insisting on '*Scientific Abstract*' and '*Plain English Summary*' - this rests on an outmoded notion that a good scientific abstract cannot be explicated in '*plain English*'. What rot!

Then we come to the words themselves, an issue that I think is subordinate to the question of how the words are strung together. There are two issues concerning word selection. First, the same word may mean different things to different people. Second, some words might

simply lie outside a reader's vocabulary. The first problem, different meanings for the same words, is much more problematic than the simple issue of vocabulary. The subject of service delivery research is bedevilled by lack of consensus over the meaning of the words that define its essential constructs [1]; so much so that it has been described as a 'tower of Babel'.[2] The only way to confront this problem is to refer to a framework into which the essential constructs can be fitted. Then the terms that might cause confusion can be explicated with reference to that framework. For example, the term intervention can be very confusing in the context of service delivery research. Sometimes it refers to a clinical intervention, while other times to a service intervention (designed, for example, to improve the uptake of a clinical intervention). In the recent call for ARC proposals I was seldom sure which of these two was being referred to. Reference to a simple, generic, causal framework for service level interventions would have cleared up this confusion.[3]

The question of vocabulary is one that is often referred to by public and patient representatives. The meaning of a word may be obscured either because it is a term of art whose meaning is specific to a particular subject or discipline, or because the reader simply has not encountered the word in their general reading. In the former instance, the solution is simply to explain the term or provide a glossary. Words like 'cluster', 'linear', 'sensitivity' and 'interaction' have more precise meanings in quantitative science than they do in the vernacular.

It has become very fashionable to criticise the use of dictionary words that are seldom used in common parlance. People who use such words are often criticised for being elitist and some people use software to identify and thus eliminate obscure words. It is also true that many superb communicators, such as Bill Clinton, Tony Blair, John Major and Winston Churchill avoided using obscure words. Nevertheless, it is also true that there are nuances of meaning



and, as Wittgenstein argued, all language is an approximation.[4] So I do not think it is fair to argue that the use of less common words is necessarily a form of elitism or showing off. Sometimes, it is an attempt to get as close as possible to what you want to say. Synonyms are approximations; they mean something similar but not exactly the same. To be solicitous is not quite the same as to be attentive. To besmirch is not identical to traduce. To extirpate is not quite the same as to remove. And isn't egregious a better fit than disgusting in many contexts? In short, do not use less common words simply in order to show off. Equally, do not rush to judgment, that the user of a word is trying to show off, merely because the word is not widely used.

What is my take-home message? It is this – do not think that writing is easy. In fact, think of writing as a method; as a method to help you organise your thoughts. How often have you set out to write a sentence with a clear idea of what you want to say, only to find that the sentence is hard to complete? The sentence is hard to complete because the thought was incomplete. The process of writing helps you to sharpen the underlying logic of what you are trying to say. It is in the very process of writing that your scientific argument takes form. Be prepared to find it hard, tear up your previous drafts, worry over the sentences that you use, and seek constructive criticism. The term 'writing', does not describe what we are really doing when we write.

References:

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2. McKibbon KA, Lokker C, Wilczynski NL, et al. A cross-sectional study of the number and frequency of terms used to refer to knowledge translation in a body of health literature in 2006: a Tower of Babel? *Implementation Science*. 2010; 5: 16.
3. Lilford RJ, Chilton PJ, Hemming K, Girling AJ, Taylor CA, Barach P. Evaluating policy and service interventions: framework to guide selection and interpretation of study end points. *BMJ*. 2010; 341: c4413.
4. Wittgenstein L. Philosophical Investigations. Oxford: Basil Blackwell Ltd; 1953.

Lives Saved: Costs Saved

An ARC WM Implementation Project

Paul Bird, Head of Programmes (Engagement); Richard Lilford, ARC WM Director;
Dr Amy Grove, Assistant Professor of Health Technology Assessment and Implementation Science

The Health Technology Assessment (HTA) programme spent £91m in 2017/18.[1] NIHR and HTA appraisal programmes consolidate many tens of millions in research costs, with NIHR research programmes having a research budget of £226m in 2017/18. Alongside this, NICE has an annual budget of around £70m.[2] In total these programmes, together with NIHR infrastructure funding streams, represent around £1 billion of investment annually from the Department of Health and Social Care.

But evidence by itself is not enough - the evidence must be implemented. We need to know what research evidence is followed and by which organisations or individuals because *lives* are at stake and there is *money* to be saved.

A typical life-saving treatment may reduce mortality by 2 percentage points. If 10,000 patients per year are affected, of mean age 50, then 200 lives could be saved each year, i.e. 7,000 life years. That is at least £140m worth of life years. Imagine the uptake of the treatment increases from 1% to 1.5% - a modest achievement. But if we think about return on investment for DHSC that would be a gain of £37.5m for the UK (or £11.6m if discounting of 3.5% is applied over 34 years).

So ARC WM will work to:

- Find the treatment examples from NIHR Signals and NICE guidance of effective and non-effective treatments.
- Evaluate implementation of this knowledge across the service.
- Identify the opportunities to intervene in cases with the greatest payback according to simple 'headroom' models.[3][4]
- Identify barriers and facilitators to implementations.[5]
- Develop interventions to try to increase uptake where the greatest health and economic gains can be made.
- Discontinue treatments shown not to be cost effective (for example plating versus close contact casting for ankle fractures [6]).

So is this already happening? One might reasonably assume, but there is much less being done than required. Why? Tracking uptake, and exploring the barriers and facilitators to implementation are deceptively complex. This is why our ARC must do so, in conjunction with other expert groups such as the West Midlands AHSN, NIHR Dissemination Centre and others research groups within this space. As ever, we invite and welcome collaborators from ARCs and beyond!

References:

1. NIHR. Annual Report 2017/2018. 2018.
2. NICE. Business Plan: objectives and performance measures 2018-2019. 2018.
3. Cosh E, et al. Investing in New Medical Technologies: a Decision Framework. *J Comm Biotech*. 2007; **13**: 263.
4. Girling A, et al. Early-Stage Valuation of Medical Devices: The Role of Developmental Uncertainty. *Value Health*. 2010; **13**(5): 585-91.
5. Lilford RJ. A Framework for Implementation Science. NIHR CLAHRC WM News Blog. 5 May 2018.
6. Keene DJ, et al. The Ankle Injury Management (AIM) trial. *Health Technol Assess*. 2016; **20**(75): 1-158.

Blind-spots in Routine Data

Daniel Lasserson,
ARC WM Acute Care Interfaces Theme Lead

The French mathematician Pascal observed that humans are paradoxical. He was right. As lead for the Acute Care Interfaces Theme I have to take two completely opposing positions on the value and use of routine data. This new theme in ARC West Midlands is linked to two distinct health databases that illustrate both the power and weakness of our quest for collating that which is already collected.

I am the Chief Data Officer of a newly funded Digital Innovation Hub in Acute Care – these Hubs showcase how industry, academics and policy makers can use existing datasets for innovation, product development and discovery. Our Hub will be a forager of every possible piece of healthcare data that is a by-product of routinely provided acute care across community and hospital settings in a population of five million people.

Population based data across all providers are compelling in their potential. We can map journeys through the labyrinth of multiple acute providers to understand how and why people access care in a crisis. We can begin to understand how to better meet the acute care needs of a large multi-ethnic and multi-morbid population with significant deprivation. Who is disadvantaged with current care delivery? How do presenting acute syndromes change as we age and become more complicated? Which diagnostic tests and treatments could we undertake outside hospital, reducing the need to leave our homes when we are unwell? Where do industry, research funders and policy makers need to focus attention to innovate and stimulate change in the delivery of acute care so that we can meet relentless increases in demand?

At the same time, I know that fundamentally important elements of acute care are completely missing from routine data. I lead a national hospital audit for the Society for Acute Medicine (SAMBA), which is designed to measure precisely the things we know are missing from all other

sources of data. This is the trouble. In order to find what matters in acute medical care, we know that we have to get into the middle of care delivery in real time and observe what is going on, and there is nothing routine about that. If I want to know the tortuous path through different care locations that a patient experiences within a hospital, then the direct clinical care team is the only reliable source.

There are more questions where routine health data collection mechanisms can't help. Do people live in a care home or their own home before they are catapulted from their bed into the emergency department? Do patients have an advanced care plan to guide the clinicians who are meeting them for the first time? When did an acute medical consultant review a treatment plan? What are the actual opening hours of an ambulatory care unit or an acute frailty unit? How can we determine the gap between work as imagined and work as done in acute care settings?

There are blind-spots of significant size and importance in data that are collected as patients pass through their healthcare provider. We have uncovered those blind-spots in the SAMBA audit because patient and clinician experiences of acute care delivery have told us what is missing and what we need to collect to understand how acute care functions. Observations that put us 'in the moment' of acute care delivery allow us to see what we are doing in acute medicine against an organisational background that is different from hospital to hospital.

To disprove Pascal and solve the paradox of believing and denying the value of routine data, our Acute Care Interfaces Theme will temper the reliance on complex analyses of what we have collated routinely with the development of new data collection systems that can re-create the delivery of acute medical care. Patients, as judges of their healthcare, should specify the data collection systems that are meaningful for their experiences of acute illness and its treatment. Then we will see clearly as healthcare observers and have true digital innovation.

PCIEP in ARC West Midlands

Magdalena Skrybant, Public Involvement Lead ARC WM & Richard Lilford, ARC WM Director

"No matter how complicated the research, or how brilliant the researcher, patients and the public always offer unique, invaluable insights."

The quotation above from Professor Dame Sally Davies, former Chief Medical Officer in England, is often cited to underline the importance of public involvement in health and social care research. Public and Community Involvement, Engagement and Participation (PCIEP) is so important because patients, their families, and members of our local communities offer skills, knowledge and perspectives on research that are different to and complement skills, knowledge and perspectives from researchers.

If we take the NIHR INVOLVE definition, public involvement is research done 'with' or 'by' members of the public rather than 'to', 'about' or 'for' them. When public involvement works well, and it is embedded in research, there is a partnership between members of the public and researchers throughout the research cycle: from shaping the embryonic ideas of a new project right through to ensuring research evidence from a completed project is taken up in practice. There are lots of ways to think about public contributors: 'critical friends', 'golden threads' running through the rich tapestry of research or 'grit in the oyster', which creates a pearl. Whichever term you choose, we know we cannot do without the 'unique, invaluable insights' our public partners can offer.

The ARC-WM 'triad' model for Public Involvement

ARC WM, which evaluates service interventions, is wholly committed to embedding the public voice. These service interventions belong to the service and to service users. They are of the service, NOT of the ARC. In some cases, service interventions would be going ahead even if there was no ARC to modify or evaluate them.

If we assume that service users are mostly interested in services that they and their loved ones will receive, it makes no sense to ask for involvement from patients and the public only on the research for which ARC is responsible and not on the service change for which the service is responsible. Public Involvement in ARC WM, therefore, will be a 'triad' model for collaboration between service managers, public contributors and researchers covering all stages of implementation and research.

Building on our processes for involving the public in CLAHRC WM, we have clear structures in place to embed the public voice at all levels in ARC WM, and resource to support activities, including a full-time Public Involvement Lead. Importantly, we have incorporated mechanisms to reflect on our public involvement activities, which will help us to learn from our experiences and further improve our ways of involving the public in our research.

In 2015, NIHR INVOLVE published, *Going the Extra Mile*, a document setting out a long-term strategy for public involvement. ARC WM's progress in aligning to *Going the Extra Mile* will be reported in future ARC WM News Blog articles. However, at this important juncture, whilst we should acknowledge that we need to work hard to ensure public involvement is embedded throughout all our activities in ARC WM, we should also reflect on the fact we will be building on strong foundations and we have an environment that is conducive to ensuring strong partnership working with members of our local communities.

The two quotes to the right illustrate the experiences of a researcher and a public contributor in CLAHRC WM.

As Public Involvement Lead for ARC WM, my hope is that in five years' time public contributors still feel that they 'can and do' make a difference, and that researchers will continue to be 'puzzled and wowed' by insights from members of our local communities.

"We really can and do make a difference!"

-- Jane Whitehurst, public contributor.

"I started working in the CLAHRC WM with only a vague understanding of the possible contribution of patient and public involvement (PPI) advisors. As I've worked through the different projects with the kind, patient, and sometimes appropriately critical support and advice that we've been given by our public contributors, I've been alternately puzzled and then totally wowed by the difference that their input has made to our work and to its value and reach."

-- Aileen Clarke, Theme Lead, CLAHRC WM.

An Enormous Study of Honesty Across 40 Countries

Richard Lilford, ARC WM Director

All economies rely on personal honesty; laws and regulations can only get us so far. An enormous study into civic honesty has recently been published in the journal of Science.[1] A field experiment was conducted in 355 cities spanning 40 countries. Wallets were dropped off in institutions where they would be seen by members of the public. These institutions covered banks, theatres, post offices, hotels and other public offices, such as courts of law. A researcher pretending to be in a terrible hurry would pass the wallet to a member of the public, saying that they had just found it lying on the ground. The wallets contained the business card of the simulated owner and they either contained no money, or local currency with a low or a high purchasing power in the country concerned. The experiment was conducted to find out what proportion of the wallets were returned and what the effect would be of varying amounts of money, from no money, to some money, to 'big' money.

Consistent across all countries was the finding that wallets were more likely to be returned if they contained money, and the effect was larger with big money then with just a little money. Even in the no money condition, over a half of all wallets were returned.

There was large variation across countries, with Switzerland, Norway, the Netherlands, Denmark, Sweden and Poland returning the largest proportions. China, Morocco, Peru and Kazakhstan came bottom of the league. The UK came in at number 22 out of 40 for the no money condition. However the UK had the greatest difference between the no money and money conditions, such that our position was a more respectable 13th when the wallet contained money. Economically favourable conditions, inclusive political institutions, and educational attainment correlated with honest behaviour.

A survey of general members of the public and also of academic economists showed that they did not predict the results of this study. In neither case did they think that money would make a return of the wallets more likely. It turns out that as the monetary value increases, so the rewards of cheating increase, but this is more than balanced by the wish to avoid feeling dishonest. That is to say, the psychological cost exceeds the financial gain, when both are high.

Reference:

1. Cohn A, Maréchal MA, Tannenbaum D, Zünd CL. Civic honesty around the globe. *Science*. 2019; **365**: 70-3.

Cluster Randomised Trial of Polypill for Prevention of Cardiovascular Diseases in Iran:

A Study Including ARC WM Collaborators

Richard Lilford, ARC WM Director

It has been over a decade since Nicholas Wald proposed combining a number of proven prophylactic therapies into a single polypill.[1] A team of researchers from the UK and Iran, including collaborators from ARC WM, have now tested this idea scientifically in a study with sufficient follow-up to measure effects on cardiovascular outcomes. This study is published in the Lancet.[2] Cluster randomisation was used to avoid contamination from sharing medication.

The polypill included aspirin, a diuretic, a statin and a beta-blocker. Nearly 7,000 individuals were entered into the study from almost 240 clusters. The incidence of cardiovascular events was reduced by a third. This reduction in risk was even greater among those who had high adherence to the polypill.

This is an extremely interesting study, and has attracted considerable media interest. It is possible that the effect size in the high-income countries would have been lower, since cardiovascular risk is lower and people obtain statins and other therapy in larger numbers at baseline.

Post script. A much weaker study (based only on physiological measurements) has recently come out in the New England Journal of Medicine.[3] Nevertheless, the findings strongly corroborate those of the Iran study in that they show a sharp reduction of risks among polypill takers.

References:

1. Wald NJ, Law MR. A strategy to reduce cardiovascular disease by more than 80%. *BMJ*. 2003; 326: 1419-24.
2. Roshandel G, Khoshnia M, Poustchi H, et al. Effectiveness of polypill for primary and secondary prevention of cardiovascular diseases (PolyIran): a pragmatic, cluster-randomised trial. *Lancet*. 2019; 394: 672-83.
3. Muñoz D, Uzoije P, Reynolds C, et al. Polypill for Cardiovascular Disease Prevention in an Underserved Population. *N Engl J Med*. 2019; **381**: 1114-23.

The Laffer Curve: A Natural Experiment

Richard Lilford, ARC WM Director

As a doctor and a researcher the ARC WM Director relies on money raised by taxation. The more tax the chancellor collects, the better for the ARC WM Director! But hang on, if the tax rate goes to high, then the tax take will decline. The function that describes the relationship between tax rate and tax take is called the Laffer curve.

While most people accept the general principle (no tax, no take; 100% tax, little or no take) there is little evidence on the tax rate at which the tax take peaks.

Until now. A natural experiment has been carried out on specialists in the NHS. [1] In order to understand this experiment it is necessary to also know about a curious feature, perhaps better termed an anomaly, in the UK tax system. The tax policy is curious because the tax rate jumps from 40% to 60% between the thresholds of £100,000 and £120,000, before then dropping back to 40%. It just so happens that £100,000 corresponds to the basic salary for a specialist in the NHS. This is serendipitous because the government has been offering doctors extra weekend work to manage surging demand. Would a marginal tax rate of 60% dissuade doctors from taking up the offer? The answer is yes. A large proportion of doctors have declined this invitation, on the basis that the reward, given this high tax rate, is not worth the effort. This is in contrast to previous incentive schemes to manage waiting list backlogs.

So here you have the answer, the Laffer curve peaks at around 40% tax rate! Okay, this is just one segment of the workforce, in one particular country, at one threshold, and it applies at the weekend. The ARC WM Director would continue to work at a higher marginal tax rate, but please don't tell anyone! The ARC WM Director loves his job, which he can do in social hours, while hospital specialists do not like being away from their families over the weekend. Obviously, a lot more information is needed. But the above evidence shows that care is needed when applying tax rates above a 40% threshold.

Readers from abroad might wonder why the tax rate should be 60% between earnings of £100,000 and £120,000 per annum, while it is 40% either side of this zone. The reason is that the tax free allowance is tapered off over this interval.

Reference:

1. Armstrong S. Cuts to Pension Tax Relief Deepen Retention Crisis for Senior Doctors. *BMJ*. 2019; 364: l206.

Adolescent Diet and Depression

Peter Chilton, Research Fellow

There is evidence that a poor quality diet is associated with an increased risk of depression. [1] We know that adolescence is a critical period for setting up healthy patterns for late life, including diet, so it is hoped that improving diet at this time could carry over into adulthood and reduce the risk of depression. This is especially important as there is an increased risk of depression during adolescence and young adulthood.

A recent paper [2] in PLoS One randomly allocated participants who scored ≥7 on a DASS-21 depression subscale (corresponding to moderate/higher depression symptoms) to take part in either a brief three-week diet intervention (consisting of a brief video from a registered dieticians instructing changes in food group intakes, i.e. increased vegetables, decreased sugar), or a habitual diet control group (who received no instructions regarding diet). At study completion data were available for 38 participants in each group. The authors found that there was good compliance with the intervention and these participants self-reported significantly lower depression symptoms than the control, on both the CESD-R scale (p=0.007) and DASS-21 depression subscale (p=0.002). The improvements on the DASS-21 depression subscale were still maintained at three-month follow-up (p=0.009).

References:

1. Lai JS, Hiles S, Hure AJ, McEvoy M, Attia J. A systematic review and meta-analysis of dietary patterns and depression in community-dwelling adults. Am J Clin Nutr. 2013;99(1):181-97

2. Francis HM, et al. A brief intervention can reduce symptoms of depression in young adults – A randomised controlled trial. PLOS One. 2019.

McKinsey Report on Innovations in Healthcare

Richard Lilford, ARC WM Director

I thank Professor Sudhesh Kumar for drawing my attention to this report from McKinsey and Company. [1] The report provides a coherent account of the major forces involved in changing healthcare. It also provides an account of the innovations in service delivery that are being used around the world to respond to these forces. The innovations cover standardised processes to improve quality and optimise productivity, automation, staff substitution, new technologies, personalised care, digitisation, and involving patients and families in care delivery. Our ARC West Midlands includes projects covering all of these innovation types. Some important structural changes include vertical integration, super specialisation and networks of providers. This report provides a useful reference for anyone wanting a coherent summary of challenges and solutions in modern healthcare delivery.

Reference:

1. Ehrbeck T, Henke N, Kibasi T. The emerging market in health care innovation. May 2010.

ARC WM Quiz

Which US President, born in the 18th Century has, at the time of writing, two living grandchildren?

email your answer to:
ARCWM@warwick.ac.uk

Answer to our previous quiz: Control charts were first devised by **Walter Shewhart** in 1924 to distinguish between assignable- and chance-cause variation.
Congratulations to Alan B. Cohen, Jenny Shepherd, Alan Hargreaves and Paul Bird who all answered correctly.

Latest News and Publications

Your Path in Research

The NIHR recently launched their 'Your Path in Research' campaign, aiming to increase engagement of healthcare professionals with research and with the NIHR. Their website has a number of case studies, videos and blogs highlighting the benefits of greater involvement, with more to come over the following weeks. There are four ways to get involved:

1. Sign up for NIHR Signals.
2. Find out what is happening in your Trust.
3. Make patients aware they could 'Be Part of Research'.
4. Suggest a research topic for the NIHR.

You can find out more at: http://www.nihr.ac.uk/yourpathinresearch.

Exploring Innovations in Transition to Adulthood

Professor Graeme Currie (lead on theme 5 organisational science), has recently been awarded a £2million grant from the Economic and Social Research Council for a four-year project on Exploring Innovations in Transition to Adulthood (EXIT study). The study aims to pinpoint the innovations that have made a positive difference to young care leavers, and identify the ways innovations are introduced, shared and adopted. It will be carried out by the Monash-Warwick Alliance, a cross-disciplinary and international team. For more information, please visit: warwick.ac.uk/newsandevents/pressreleases/researchers_look_for.

2019 Nobel Prize in Physiology or Medicine

The 2019 Nobel Prize in Physiology or Medicine was recently jointly awarded to William G. Kaelin Jr, Sir Peter J. Ratcliffe and Gregg L. Semenza "*for their discoveries of how cells sense and adapt to oxygen availability*." They identified the mechanism through which cells are able to regulate the activity of genes in response to varying levels of oxygen, which will hopefully pave the way for promising new strategies targeting anaemia, cancer and various other diseases. Find out more at:

https://www.nobelprize.org/prizes/medicine/2019/press-release/

Latest Funding Opportunities

The NIHR have announced the following funding opportunities on their Health Services and Delivery Research programme:

- 19/117 Adult social care partnership.
- 19/118 Non-medical workforce in urgent and emergency care settings.

GAVI: Cause for Celebration

This article originally appeared in the September 2019 issue of JASS (Journal Article Summary Service). It is reproduced with kind permission from Prof Athol Kent.

When people live healthily – no one applauds. If illnesses are avoided – no one applauds. But everyone should applaud GAVI.

The Global Alliance for Vaccine and Immunisation (GAVI) is one of the success stories of modern medicine. It was founded in Davos, Switzerland at the Economic Forum in 2000 and it has prevented an estimated 13 million deaths. Its credentials for being a triumph for humankind are unrivalled and under-appreciated (Berkley S. JAMA 2019; 322:1251-2. doi: 10.1001/jama.2019.13190).

- The partners in GAVI are WHO, UNICEF, the World Bank and the Bill & Melinda Gates Foundation.
- It pulls together agencies, foundations, governments, donors, businesses and entrepreneurs from the private sector. It has provided vaccines for 760 million children for 18 diseases.
- For every dollar invested by GAVI – 21 dollars are saved directly in medical costs and twice as much saved in longer, healthier lives.
- GAVIs costs are shared by the governments of the countries within which they work who must eventually transition to independence from GAVI.
- Fifteen of the world's poorest countries have successfully moved from GAVI to their own vaccination financial planning.
- GAVI has massively reduced vaccine costs by bulk buying from manufacturers.
- Its economic muscle has prepaid vaccine development – for example Ebola vaccine which is now available with stockpiled resources.
- It uses innovative distribution techniques and operates the world's largest drone transport network in Ghana. It delivers health products to 12 million people.
- GAVI's commitment is to eventual universal vaccine coverage for the whole world and hopes to achieve this goal by 2030.
- Its present aims are to operate in conflict zones, metropolitan slums and reach children who have not received vaccines.
- Malarial prevention, nutritional supplements plus maternal and neonatal health services are also within GAVI's sights.
- GAVI won the Lasker-Bloomberg Public Service Award in 2019.
- For GAVI's new ventures see Usher AD. Lancet. 2019; 394: 817-8. doi: 10.1016/S0140-6736(19)32044-6.

Recent Publications

While we have not yet published any ARC-related research, papers from CLAHRC West Midlands research continue, including:

- Abdillahi FA, Ismail EA, Singh SP. Mental Health in Somaliland: a critical situation. *BJ Psych International*. 2019.
- Bradshaw S, Bem D, Shaw K, Taylor B, Chiswell C, Salama M, Bassett E, Kaur G, Cummins C. Improving health, wellbeing and parenting skills in parents of children with special health care needs and medical complexity - a scoping review. *BMC Pediatrics*. 2019; 301.
- Chen WMY, Subesinghe S, Muller S, Hider SL, Mallen CD, Scott IC. The association between gravidity, parity and the risk of developing rheumatoid arthritis: A systematic review and meta-analysis. *Semin Arthritis Rheum*. 2019.
- Daley A, Jolly K, Jebb SA, Roalfe A, Mackillop L, Lewis A, Clifford S, Usman M, Ohadike C, Kenyon S, MacArthur C, Aveyard P. Effectiveness of a behavioural intervention involving regular weighing and feedback by community midwives within routine antenatal care to prevent excessvie gestational weight gain: POPS2 randomised controlled trial. *BMJ Open*. 2019; **9**(9): e030174.
- Grantham KL, Kasza J, Heritier S, Hemming K, Litton E, Forbes AB. How many times should a cluster randomized crossover trial cross over? *Stat Med*. 2019.
- Leighton SP, Upthegrove R, Krishnadas R, Benros ME, Broome MR, Gkoutos GV, Liddle PF, Singh SP, Everard L, Jones PB, Fowler D, Sharma V, Freemantle N, Christensen RHB, Albert N, Nordentoft M, Schwannauer M, Cavanagh J, Gumley AI, Birchwood M, Mallikarjun PK. Development and validation of multivariable prediction models of remission, recovery, and quality of life outcomes in people with first episode psychosis: a machine learning approach. *Lancet Digital Health*. 2019; **1**(6): e261-70.
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