In this document, information from several sources is presented to offer ideas on how we can move Aotearoa- New Zealand's science system towards a healthier and ethical strategic planning framework, which encompasses innovation, diversity, inclusion, equity, and collaboration. We can be better, so let us do better! As experts in this area, you are likely familiar with the information reported in this document and are now discussing their application. However, if some of these suggestions are new, perhaps they will be relevant and welcomed.

Contents

Te Tiriti, Mātauranga Māori and supporting Māori aspirations

❖ Fostering relationships and engagement for Te Tiriti o Waitangi and Taonga and Mātauranga Māori principles

Summary

- Funding and resources available for early relationship-building and engagement
- Positions for research coordinators to organise and support collaborations with indigenous communities
- Biannual hui to encourage engagement and network building for researchers (particularly for early-career researchers) and Tāngata whenua

Taken from Saima May Sidik (2022) **Weaving Indigenous knowledge into the scientific method**, *Nature Career Feature*

"One way in which we help to spur productive relationships is by giving research teams a year of preliminary funding — before they even start their research — so that they can work with Indigenous groups to identify the questions their research will address and decide how they're going to tackle them. "

We need funding agencies to set aside money – which will also pay for time - for this type of early relationship-building so that everyone goes into a project with the same expectations, and with a level of trust for one another.

"Developing relationships takes time, so it's easiest when Indigenous communities have a research coordinator to handle all their collaborations. I think the number of such positions could easily be increased tenfold"

Funding

Summary

- Monitoring to ensure funding system is addressing biases (i.e. Matthew Effect, and that there is a balanced proportion of fundamental and application projects)
- A number of smaller blue skies grants to reach a greater number of researchers
- Adopting new ways of reviewing grants – include early career researchers as grant reviewers and various professionals to review interdisciplinary work
- Funding systems that keep up with inflation and increased costs of doing research
- Advance funding notices, particularly for international collaboration grants. Several of these funds that apply for a collaboration with certain countries provided only ~3months notice, which is difficult if you wish to approach a potential new collaborator
- Long funding periods (long-term grants) and flexible funding, which consider the long-term nature of specific scientific projects, postdoctoral career development, and PhD course of study. Many grants are for 2-3 years, while many PhDs now take 4-5 years to complete, though this depends on the discipline. Additionally, contracts and IP agreements can take some time to implement.
- Flexibility in managing grant funding, as some grants do not match up with institutions, universities, and companies' end of financial years. This can lead to unnecessary spending in the first year, which could be used more effectively in the final year of funding.
- Overhaul of the overhead system as it leads to a reliance on PhD students as Post-docs and ECRs costs are too high to include them as full-time researchers
- Experiment with new funding practices (i.e. randomization)
- Constructive feedback
- Transparent metrics (economic, social, environment, research & development) and presenting of data to enable the community to see how practices are tracking

❖ Matthew Effect

The following is taken from Bol T, de Vaan M, van de Rijt A. The Matthew effect in science funding. *Proc Natl Acad Sci U S A*. 2018;115 (19):4887-4890.

"Why do scientists with similar backgrounds and abilities often end up achieving very different degrees of success? A classic explanation is that academic achievement exhibits a "Matthew effect": Early successes increase future success chances. Scientists who have previously been successful are more likely to succeed again, producing increasing distinction.

We investigate to what extent the Matthew effect drives the allocation of research funds. To this end, we assembled a dataset containing all review scores and funding decisions of grant proposals submitted by recent PhDs in a V2 billion granting program.

Analyses of review scores reveal that early funding success introduces a growing rift, with winners just above the funding threshold accumulating more than twice as much research funding (V180,000) during the following eight years as nonwinners just below it. We find no evidence that winners' improved funding chances in subsequent competitions are due to achievements enabled by the preceding grant, which suggests that **early funding itself is an asset for acquiring later funding.** Surprisingly, however, the emergent funding gap is partly created by applicants, who, after failing to

win one grant, apply for another grant less often. Nonwinners ceasing to compete for other funding opportunities, results in a "participation" mechanism driving the Matthew effect.

We conclude that funding of **early career scientists exhibits a Matthew effect that operates through two mutually reinforcing processes**: On the demand side, candidates who won prior awards are evaluated more positively than nonwinners, while on the supply side, scientists who were successful in past contests select themselves into applicant pools of subsequent contests at higher rates than unsuccessful scientists.

Prior academic success is often a merit review criterion, investigators are often unlimited in the number of grants they can pursue, and information about an applicant's past grants is often available for consideration by reviewers, panelists, and program directors. Our results thus **raise the question of whether funding organizations worldwide should change the common practice of providing information on prior awards and other investigator success metrics to evaluators of applications.**

The observed tendency for winners of earlier grants to try their luck in later competitions in greater numbers than nonwinners suggests that **funding agencies could consider outreach efforts aimed at reducing this gap.** One costless measure that agencies may take is providing unsuccessful applicants with detailed information on how close evaluation scores were to the funding threshold, which may prevent near-winners with good past proposals from concluding that future odds are too low for investing time and effort in a new application.

Recent studies have documented rising inequality among scientists across the academic world. Not only do our findings suggest that positive feedback in funding may be a key mechanism through which money is increasingly concentrated in the hands of a few extremely successful scholars, but also that the origins of emergent distinction in scientists' careers may be of an arbitrary nature. This raises the question of whether, especially in fields where materials and infrastructure costs are modest, the distribution of smaller grants across a larger number of scientists could reduce inequality and improve meritocracy without sacrificing efficiency."

Table taken from Meirmans S, Butlin RK, Charmantier A, et al. Science policies: How should science funding be allocated? An evolutionary biologists' perspective. *J Evol Biol.* 2019;32(8):754-768.

❖ Allocation of science funding recommendations

Recommendations for best practices with respect to maximizing scientific quality

Element of funding	Recommended best practices
Societal relevance	• Overt emphasis should be on research approach and design rather than project outcome
Top-down vs. bottom-up	• Fund bottom-up research that also (when applicable) integrates science in society aspects • Reduce top-down constraints
Applied vs. basic	• Set apart substantial explicit funding for basic science
Allocation of money	• Mainly small amounts to many researchers • Some larger funds to interdisciplinary groups (e.g., excellence centres)
Consortia vs. individual-led	• Fund both consortia and individual-led projects, which each confer specific and unique benefits
Long-term vs. short-term	• Fund more long-term research • Provide checkpoints and follow-ups

Flexibility of funding schemes	• Increase flexibility in time, budget, team size with respect to best fit to the research vs. meeting inflexible standards
Acceptance rates and who applies	• Provide smart demand management schemes (e.g., limit no. of applications/researcher; size and type budget/researcher; etc.) • These schemes should be field/domain-specific
Who/what is being judged?	• Establish different categories: e.g., quality of project for younger researchers; quality of researcher for established researchers
Administrative burden	• Reduce and simplify • Tailor length of grant sections to evaluation type needed
Who is reviewing	• Panel and external experts • Invest in the quality of the experts and panel; reviewers from other countries in most smaller countries
Interviews/rebuttals	• More rebuttals in general
Mobility	• Encourage mobility when reasonable • Emphasize flexibility, leaving the possibility to tailor to the individual needs of project/researcher
Diversity	• Increase funds, and their diversity, for vulnerable groups • Within projects, demands for diversity should fit the project rather than attempt to meet preset standards • Within projects, take into account different hierarchy levels within an organization

❖ Danish randomized approach to allocation of science funding to reduce bias

Taken from Natalia Mesa (2022) **Q&A: A Randomized Approach to Awarding Grants**, *The Scientist*

"The Novo Nordisk Foundation, one of the largest private scientific research funders in the world, announced last month that it would begin employing a partial randomization system to fund some types of research projects. For the next three years, the Copenhagen-based funding agency will use a combination of committee selection and a lottery system to choose some of the awardees of its $500,000 Project Grants in the fields of biomedicine, biotechnology, and natural and technical sciences, as well as its $800,000 Exploratory Interdisciplinary Synergy Grants. Together, these grants comprise roughly 10 percent of the organization's total research project funding, says Lene Oddershede, the senior vice president of natural and technical sciences at the Novo Nordisk Foundation, who oversees the grant funding process. She says she hopes that the partial randomization system will reduce conscious and unconscious bias in the committee selection process and improve funding inequities.

In Denmark, **90 percent of the funding goes to just 20 percent of researchers, and a similar concentration exists in many countries**. According to recent studies in the United States, for instance, funding inequities have increased in the past decade. In 2020, the top 1 percent most highly funded investigators received 10 percent of the National Institutes of Health's Research Project Grant (RPG) funding, an increase of 2 percent from 2013, while the least-funded half of investigators received only 20 percent of the total RPG funding, a number that has stayed static for the past decade. And last year, white, cisgender, late-career researchers and men received funding more often than women, early career researchers, and members of other racial groups or Latinx researchers.

A partial lottery may alleviate the tendency for committee members to favor established researchers, Oddershede says. Novo Nordisk also hopes the randomization will lead to funding more high-impact projects and increase the diversity of their selection pool. The foundation plans to

collect information on how the partial randomization system impacted the types of projects funded over the efforts first three years.

We have a trial period of three years. And in that three years, we run two processes in parallel. One of them is a partial randomization, which I just explained. The other one is a completely normal process. We will have two datasets, one selected by partial randomization and the other one selected by the normal method of the committee. And after three years, we're going to compare those two datasets and ask: what did we achieve with this? Was partial randomization better in maybe eliminating some of the unconscious biases? Did we have more high-risk, high-gain projects?

We have an obligation to constantly strive to be better at awarding grants and constantly strive to award grants without biases, conscious or unconscious. There can be gender biases, age biases, there can be biases against certain institutions or certain citizenships. These biases could be in terms of scientific area—a typical professor tends to be most excited about the type of research that he or she does. There can be all kinds of biases. Some of these are conscious and some of these are unconscious. I would anticipate that the partial randomization process would also mitigate racial biases as well."

***TS*: What are the metrics that you'll use to compare your two samples?**
LO: The impact measures which we are going to look at would be gender distribution, career level, institutional affiliation, the field which is funded . . . that's another goal: we also try to fund new fields of research. . . . Of course, we're going to use the more typical metrics, like citations, number of publications, the impact of journals in which the [publications appear], and social media, et cetera. But of course, it would be difficult [to see much in those metrics] after three years, because much research takes a little bit longer before it has a major impact, say, on citations, et cetera."

Workforce

Summary

- Trial practices that may improve equity
- Improve the research work environment
- Avoid exploitation by offering long-term contracts, and career developmental pathways
- Postdoctoral training programmes (industry and academic)
- Stronger diverse representation and inclusion in high-level decision-making processes (this may already be the case but it is currently not transparent)
- Perhaps consider diversity requirements as there are plenty of talented people available to lift into these roles. The presence of diverse people in leadership roles could have positive effects through inspiring other minorities to apply and progress in the field. Over time, the numbers of minorities may increase and obligatory 'requirements' then can be removed.
- Encourage cooperative teamwork than individual competition
- Monitor metrics to be able to address biases
- Evolving research culture - We can do better

❖ Fostering a healthy research environment

The Greenpaper and workshops showcased the amazing opportunity to encourage the research culture towards one of inclusivity, career development, and diversity.

A question is what will the value system be as we move forward? The value system going forward will affect the ethics and motivations of the community.

Funding dictates what projects are being worked on and what flourishes. As a small country with limited funding resources – can we develop new ways of better maximising our knowledge, workforce, and skills? Presently, it seems for some institutes it is "money over mana". Economic value and contribution is extremely valuable and it allows for research to be financially supported and great meaningful work to be done. However, if the pendulum swings too far in this direction we may end up focusing on work with immediate economic returns and suffer in innovative environmental and/or societal research, which will have positive impacts in the long term.

Do we have a majority of funds rewarded towards a small proportion of Aotearoa-New Zealand researchers, similar to overseas statistics? If so, is there a possibility this could contribute to a hierarchical system that promotes exploitation, harassment, sexism, and racism?

- **Workplace conditions that adapt to the generation** (the following is taken from "Shelby Heinrich (2021) This Woman Went Viral For The "Millennial Rant" She Sent To A Reporter, And I've Gotta Say, I Agree With Everything She Said", *BuzzFeed*)
    - Pay them well above minimum wage with at least a 5% raise every year to accommodate for the increased cost of living-
    - Benefits that cover mental health and infertility treatment
    - Sick leave that includes openness and the need for mental health days
    - Paid parental leave that reflects a home where both parents work full time and don't receive any homemaking support
    - Opportunities to hone existing skills, learn new skills, receive certifications, mentorship, etc. all done on company time as opposed to paid leave - **Jessie DaSilva**

- **Reducing hierarchies and establishing protective mechanisms in the system**

There is an impression a strong hierarchal class system has been developing over the past decades. This class system where the 'bottom' class has to account for their time, along with the increased workloads due to difficulties hiring people unless they have economic value, can create a toxic workplace where people's value is based on monetary terms.

There are several instances where senior leaders and managers treat those lower than them in a somewhat bullying manner – mainly because they are in a position of power and can treat 'juniors' and/or those they do not like, not as people but as workers who are supposed to do as they are told.

Coded versus the non-coded hours

Furthermore, there are instances where those in support roles, whose hours are not held accountable, will see an under-coded researcher and comment the researcher is underperforming, or question whether the researcher is doing any work. This is creating another class system and may cause feelings of unjust and/or hostility between those held accountable for their hours and those who are not. However, just as the professional in the support role is working on many tasks, they fail to understand the researcher is too employed on various projects and duties related to their role, which may not be coded.

Toxic environments

Research suggests people often targeted are women and minorities as they are less likely to speak up due to repercussions to their career.

- Attell, Brown, and Treiber (2017), Workplace bullying, perceived job stressors, and psychological distress: Gender and race differences in the stress process, *Social Science Research,* 65:210-221)
- Rosander, Slin, Viita, and Blomberg (2020), Gender Matters: Workplace Bullying, Gender, and Mental Health, *Front. Psychol.,* 11:1664-1078

"*in organizations whose employees opt not to speak up about the problems they see because of fears of being ostracized, harshly evaluated, and/or a target of future retaliation by coworkers or supervisors who prefer them to remain silent*". - Debra L. Shapiro (2021), University of Maryland's Robert H. Smith School of Business.

Toxic research environments with strong hierarchical –unequal systems can lead to unreported harassment (e.g. bullying and sexual harassment)

"*Setting up policies, practices, and procedures to protect psychological health by developing a strong Psychosocial Safety Climate"…"The starting place is measuring work demand so that an organization can mitigate the risk in the first place. Once they do this, they can develop protective actions that can prevent the development or continuations of harmful workplace norms*." – Prof Lushington 2021, University of South Australia

Some have said "I had to go through this" and "young people are too sensitive nowadays". For these people, certain kinds of behaviours are normalized but this doesn't make it right. We must remember that some things that were acceptable 10-50 years ago are nowadays deemed inappropriate.

❖ Equity

Diversity committees – shadow boards

- Shadow board: "the shadow board includes people drawn from different functions. They talk through the issues that the executive committee is focused on and their insights have "served as a wakeup call for the executives."… One project, aimed at reducing supply-chain lead time, had stumped a supposedly expert team. The new team came up with a workable plan within six months. No team members came from the business unit in question, nor had they any prior supply chain experience. "The shadow board succeeded in part because they focused on their vision and developed their point of view "regardless of all internal and cost constraints."
- An open-application process — "allowing anyone who fit certain criteria to apply. Doing so not only created a more diverse cohort; it also allows the discovery of some hidden gems who would not otherwise have been on the radar. Interestingly, they tested the performance of the company's top forty high potentials (who were clear shoo-ins for the program) against the employees chosen via open enrollment. On abilities such as data analytic skills, sense-making, and teamwork, the open-enrollment members outperformed the high-potentials."

Taken from Jordan and Sorell (2019), Why You Should Create a "Shadow Board" of Younger Employees, *Harvard Business Review*

Opt-out mechanisms to increase diversity and recruit bring more talented minorities and women on-board

"Most organizations follow an opt-in mechanism when it comes to leadership roles. This mechanism

assumes that people are not a part of the leadership process as a default and must instead put their hands up and opt-in to be considered. In contrast to this is the opt-out mechanism, which, as the name suggests, implies that everyone who is qualified is assumed to be interested in leadership roles unless they specifically choose to opt out.

They found that women were significantly less likely to participate in leadership selection under the opt-in mechanism, even when they knew that their performances were among the best. They also found that this gender gap disappeared when the competitive element to the selection process was removed, indicating that women may be discouraged from participating in the leadership selection process due to the competitive nature of the opt-in mechanism."

Taken from Elsevier Communications (2021), Improving gender diversity in leadership by 'opting-out' of the default and Erkal, Gangadharan, and Xiao (2021), Leadership Selection: Can Changing the Default Break the Glass Ceiling? *The Leadership Quarterly*

Positive effects of diverse representation

A way to show the scientific research environment is inclusive is to have representation of women and ethnic minorities, including people with disabilities. One study showed if high school students perceive the environment to be inclusive, they are less likely to experience discrimination. If this can work for the high school environment, could it not work for the science working environment? "We find that, generally, students do believe their STEM classrooms to be inclusive and that they report low levels of STEM teacher discrimination. However, we also document relations between higher levels of inclusion, higher belonging, and more STEM engagement in and out of school. Moreover, we document direct, negative impacts of perceptions of discrimination on STEM class engagement. These findings suggest the vital importance of attending to issues of climate in STEM classrooms and ensuring that students feel welcomed, included, and supported in STEM environments." Copied from Mulvey, Mathews, Knox, Joy, Cerda-Smith (2022), The role of inclusion, discrimination, and belonging for adolescent Science, Technology, Engineering and Math engagement in and out of school, *Journal of Research in Science Teaching*

❖ Early career researchers (ECRs)

Taken from Martinez, Lyons, Herzog, Tata, von der Lehr, and Jain (2021), Creating an Inclusive Academic Research Culture, *Lab Manager*

"Discussions during the NJF workshops gave rise to a number of possible solutions. Equitable rules for career development would encourage playing as teams (cooperation), rather than as individuals (competition), starting with improving the way credit is given for contributing to publishing scientific data or conducting projects. "

ECRs were strongly in favor of separating funding pools and setting caps on what a single group leader can receive.

For effective funding pools, inclusive considerations need to be made to avoid replacing one set of inequitable house rules with another, such as biological or academic age as eligibility criteria. Funding through more stable, institutional, or state funds could help shift away from a precarious and project-based funding culture, and randomizing funds at late stages of project evaluation can help counter bias and diversify the reach of public money.

Constructive feedback from funding agencies and senior researchers would help those who fail to attract funds and make the process more pedagogical.

The game should provide enough incentives for players to feel motivated to continue and enjoy the struggle of research, even if there are few winners. Not everyone will win the research grant or academic position of their dreams, but the joy of playing needs to be enhanced. It may mean the extension of "winning" to embrace and promote other scientific careers and pathways outside of academia, where ECRs can apply their knowledge and experience."

❖ Pricing system

Would a value-based pricing system work better instead of an hourly rate system?

The hourly rate system is difficult because there are instances where people can end up over-coded in a year (i.e. ~1.3 years of work to be done in 1 year). How can anyone balance such a heavy workload while trying to have a life outside of work?

There is also the challenge of un-coded work – when times are financially difficult, the hours you are coded may reflect your value to the company, research institute, or university.

Yet there are impediments to providing the full amount of time a project requires as funding is limited, the cost of materials and services is rising and projects rightfully move towards larger interdisciplinary teams. To ensure the research gets done, researchers need to enter a lower amount of hours to afford necessary materials and services, as well as include key team members.

Is there concerns this leads to a system where:

- If hours are coded accurately, there may be insufficient funds for performing high-quality experiments, particularly in expensive fields such as molecular and cellular biology?
- Incentivize projects in disciplines with fewer expenses, and/or result in simpler projects that provide fewer insights? As an example, instead of being able to assess numerous components to gain a holistic understanding, the researchers have enough funds to focus on a single element.
- Loss of talented researchers as funding becomes more difficult to secure? If the hours for the researcher is not in high demand, either because they are constantly having to keep them low or funding was not secured for the following year, an institute may reconsider their employment.
- Minimal collaboration with other Aotearoa-New Zealand researchers, specifically external researchers, due to high overheads and associated costs or working with someone outside your institute?

Is a researcher any less valuable than a support staff member who has does not have account for their hours? And what about work that involves un-coded hours? Developing ideas, writing proposals, attending courses/workshops/conferences, supporting committees, initiatives, or organising meetings that add value to the community or institute at large? If we start focusing on hours – as it seems we are heading in this direction at the moment, then overloaded talented researchers will have limited time to contribute to un-coded activities. There will be burnout, mental health issues, and a stressed-out science workforce. Previous generations would argue they had this experience and this is the price to pay, however, we are living in a different environment from 20-30 years ago.

Value-based pricing

Copied from Lee Frederiksen (2022), Value-Based Pricing for Professional Services**,** *Hinge Marketing*

"Increased competition and commoditization of services put downward price pressure on services even as talent shortages drive up costs. And the advent of artificial intelligence and automation threatens to undermine some firms' core service offerings. It should come as no surprise, then, that many voices have suggested the adoption of alternative pricing models to reflect new approaches to building and capturing value. This post will focus on one of the most promising of those approaches, value-based pricing.

Value-Based Pricing Defined

Value-Based Pricing is a pricing strategy that attempts to capture the extra value that a particular client segment associates with a particular feature or benefit of your firm's service. It requires that your service offering is different in some meaningful way from your competitors (i.e., differentiated) and that potential clients value that difference.

Value-based pricing rests on two key concepts. First, the value of a service is subjective and will likely vary for clients in different circumstances. Further, a given service may be perceived as more or less valuable depending on how it is "framed" or explained. This point is particularly important for professional services, since many clients have little understanding of the real business value of the services they buy.

The second key observation is that the cost of providing a service is only partially related to its perceived value. The client is the final judge of the value received and is often unaware of what is involved in providing a deliverable. This can lead to mismatched expectations between client and service provider. "

Infrastructure

Notes

- Coordinated networks to develop simpler reporting systems
- Collate resources (i.e. funding information, training resources, equipment, networks, meetings etc…) and deposit in a one-stop site
- New agencies for research support and foster engagement with society, industries and professionals; i.e. ScienceBridge GmbH, a German agency representing universities and scientific institutions, which assesses scientific inventions for intellectual property patent application and economic potential. The agency connects researchers and institutes with worldwide partners interested in the invention, handles marketing, negotiations, and monitors licensing agreements
- Multiple funding streams – For example, specific programmes that sponsor engagement opportunities with Māori and research of priority for Tāngata whenua,
- Maintenance support: Data collection agencies – to collect baseline data, field stations, data analysis, and biobanks
- Preparation for the digitization of data and laboratories
- Processes to ensure contracts and IP systems between Aotearoa-New Zealand based research institutions flow easier and faster – often this can take a few years to sign off and for government-funded research, shouldn't the IP belong to Aotearoa-New Zealand and not be fought over by individual institutes?
- Centralised lifecycle analysis of equipment and relevance to future science strategies and policies

- Establishment of research hubs (similar to A*STAR, Max Planck Institutes)
- Investments and long-term funding to develop infrastructure in the form of: data collection (biobanks, biodiversity data, IT infrastructure, research facilities), research knowledge and application translations, laboratory and data digital transformations, training and support programmes, national field station networks, e
- Monitoring and reporting of how the Aotearoa-New Zealand Science environment in tracking in key areas beyond econometrics, such as diversity, inclusion, health, and research culture

Mental Health

The below text was taken from Molly Campbell (2021**),** Exploring Mental Health in Academia, *Technology Networks*

"The full results of the comprehensive report are available to access online, but to summarize, the key findings include:

- Poor research culture is leading to unhealthy competition, bullying and harassment, and mental health issues
- The system favours quantity over quality, and creativity is often stifled
- Researchers are passionate and proud about their work, but have concerns about job security

Jeremy Farrar, Director of Wellcome, said: "These results paint a shocking portrait of the research environment – and one we must all help change. The pressures of working in research must be recognized and acted upon by all, from funders, to leaders of research and to heads of universities and institutions."

Open Academics add, "Academic working culture can make it difficult to cope with every day "musts". I feel like academia is getting more and more demanding, where journals are requiring more than ever, which translates to professors putting more pressure on students to "get things done". These professors have, in my experience, no or only limited training in dealing with mental health issues."

Exploring the extent of the (global) problem

In their study *Work Organization and Mental Health Problems in PhD Students,* Levecque *et al* (2017) surveyed 3,659 Belgian doctoral students from a variety of universities and disciplines.[1] Fifty one percent self-reported having at least two mental health issues (such as depression, anxiety), 40% reported three or more, and 32% reported at least four. The research also found that mental health problems are higher in PhD students (from a variety of disciplines) compared to other populations.

Liu *et al* (2019) surveyed doctoral students in China and found that 41.2% of doctoral students demonstrated symptoms of mild depression, 23.7% mild-moderate, and 20% moderate-severe anxiety symptoms.[2]

The Advanced HE's annual Postgraduate Research Experience Survey (PRES) of over 50,000 postgraduate researchers incorporated new wellbeing questions for 2019. The full report is available online, and reveals "striking" levels of anxiety within the population – only 14% reported that they had *low* anxiety.

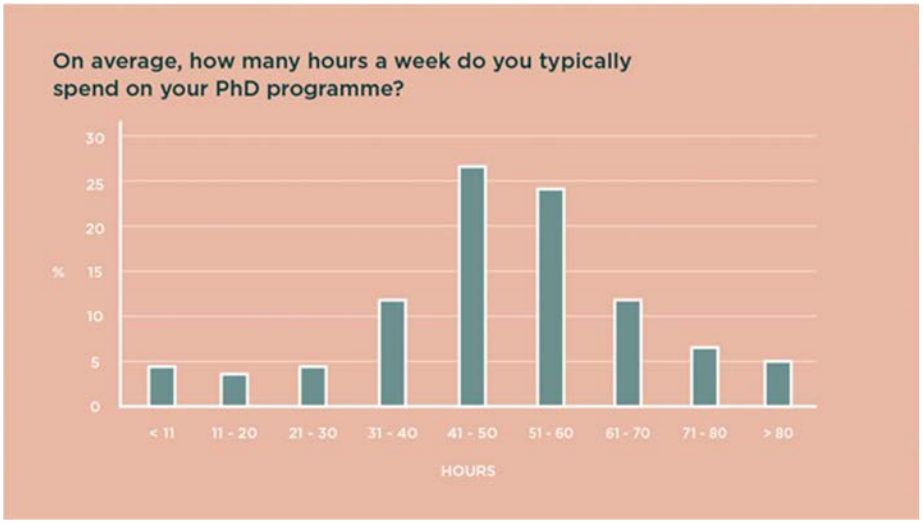
The journal *Nature* runs a global annual survey for doctoral researchers. The survey had over 6,000 respondents in 2019 and featured a question exploring mental health. Thirty six percent of the survey participants said that they had sought help for anxiety or depression caused by their PhD studies. Chris Woolston's commentary piece, aptly titled *PhDs: the tortuous truth* expands on the survey findings.

"Graduate school is a notoriously challenging environment"
"Graduate training is hard for so many people's mental health because of the inherent loneliness, competition, and high-pressure environments people face. We are often away from our support systems, can't always confide in our colleagues, can't relate to old friends, and may feel that we are constantly three steps behind where we should be," Susanna Harris tells me.

"Graduate school is a notoriously challenging environment for mental health wellbeing. I think the hardest part for me has been transitioning to seeking professional care in the context of my university's large and slow-moving bureaucracy. Appointments at our student counseling and psychological services are limited to only six visits per year."

Long-hours culture: quantity over quality?
Del Carpio also raises a point that is highlighted in the 2019 *Nature* survey – long hours culture: "I've encountered people who still hold on to models of academia where you can only be successful by working long hours and weekends. I've even been told by a faculty member at my university that if I'm not willing to do so, I need to find a different career."

The *Nature* survey found that 27% of respondents spend 41-50 hours on their PhD programme per week and 25% report that they spend 51-60 hours. The participants that reported spending 41+ hours a week on their PhD, 85% were dissatisfied with their hours worked. Data from the Office for National Statistics suggests that average number of hours worked by an individual in the UK per week typically range between 36-37 hours. It therefore seems that many PhD students are at the risk of working significantly longer.



Data from the Nature PhD Survey 2019.

OpenAcademics say, "Unfortunately, the academic culture for some reason is blindly looking at quantity of hours rather than quality. Expectations to work long hours and weekends can be difficult to handle as an early career researcher." How can we look to change this seemingly engrained perception that more hours equal more success? Del Carpio comments: "I've been able to seek out communities and support networks within academia that do validate my decisions to prioritize my mental health while ignoring those who don't."

Stigma
Unfortunately, individuals that suffer with a mental health condition are often challenged two-fold. First of all, they are confronted with the symptoms of their disorder and the impact it can have on their life. Secondly, they face stigma.

But how exactly do we fight stigma? In a comprehensive article, *Reducing the stigma of mental*

illness, H. Stuart says that: "Decreasing mental illness-related stigma and the hidden burden of mental illness worldwide will take a concerted global effort."[3] The organization *See Me* provides a list of helpful suggestions for ways that, as individuals, we can help to eliminate stigma surrounding mental health issues on a day-to-day basis.

"We are far from where we want to be"

It's only over recent years that the lid has really been lifted on the extent of poor mental health in academia. The increasing awareness can be attributed to the brave individuals that are speaking out about their own personal experiences, and the published research that has endeavoured to gather quantitative and qualitative evidence when exploring the issue.

This poses one question. The research and the data are there – so are institutions working with it?

I ask Harris whether she felt the current frameworks in place to support graduates are sufficient: "Wow, this is a hard one. While I do think many, many people around the world are working diligently to address these issues, we are far from where we want to be." She continues, "No environment is perfect, but if academia holds itself to the highest standards (as we often claim) we need to be more honest about the reality of how many are struggling without access to support."

Time for change in research culture

It's hoped that calling for a change in conversation will in turn lead to an overall change in research culture, as the problem in academia doesn't end when finishing a PhD. The necessity for this change was recently highlighted in the largest ever survey into experiences of research culture by the Wellcome Trust.

OpenAcademics, Susanna Harris – PhD Balance and Christina Del Carpio – The Anxious PhD Student, were speaking to Molly Campbell, Science Writer, Technology Networks.

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