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The Research Pipeline

Katie Severn

Research culture

*'**Research culture** encompasses the behaviours, values, expectations, attitudes and norms of our research communities… **affects who does research**, what research is done, how it is done and how it is disseminated' – Royal Society*

I would also argue it is affected by who does research

Why diversity improves research culture

Diverse perspectives lead to higher creativity.

Inclusive companies are 1.7 times more likely to be innovation leaders in their market.

Gender diverse teams are more generous, feel more psychological safety and build more meaningful relationships.

Diversity adds new skills to teams.

Diverse teams solve problems faster than cognitively similar people.

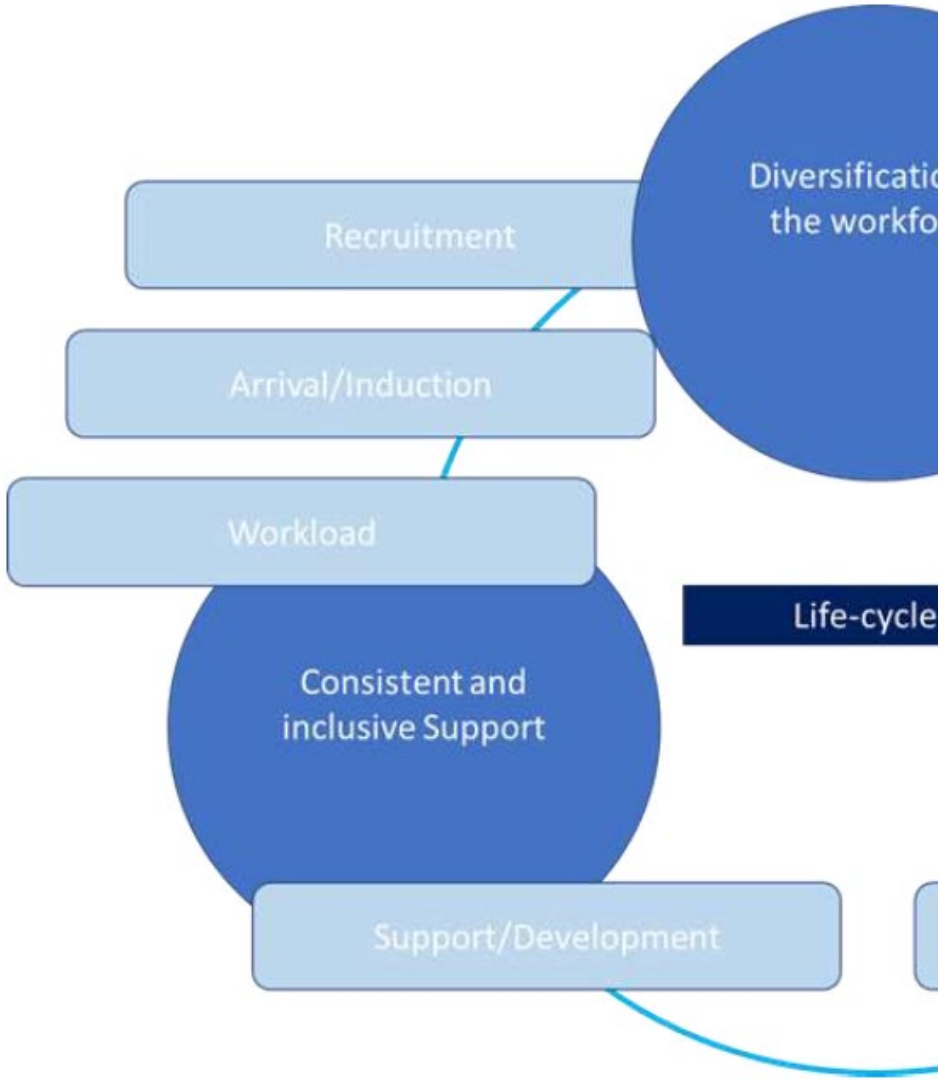
Members more likely to feel included.

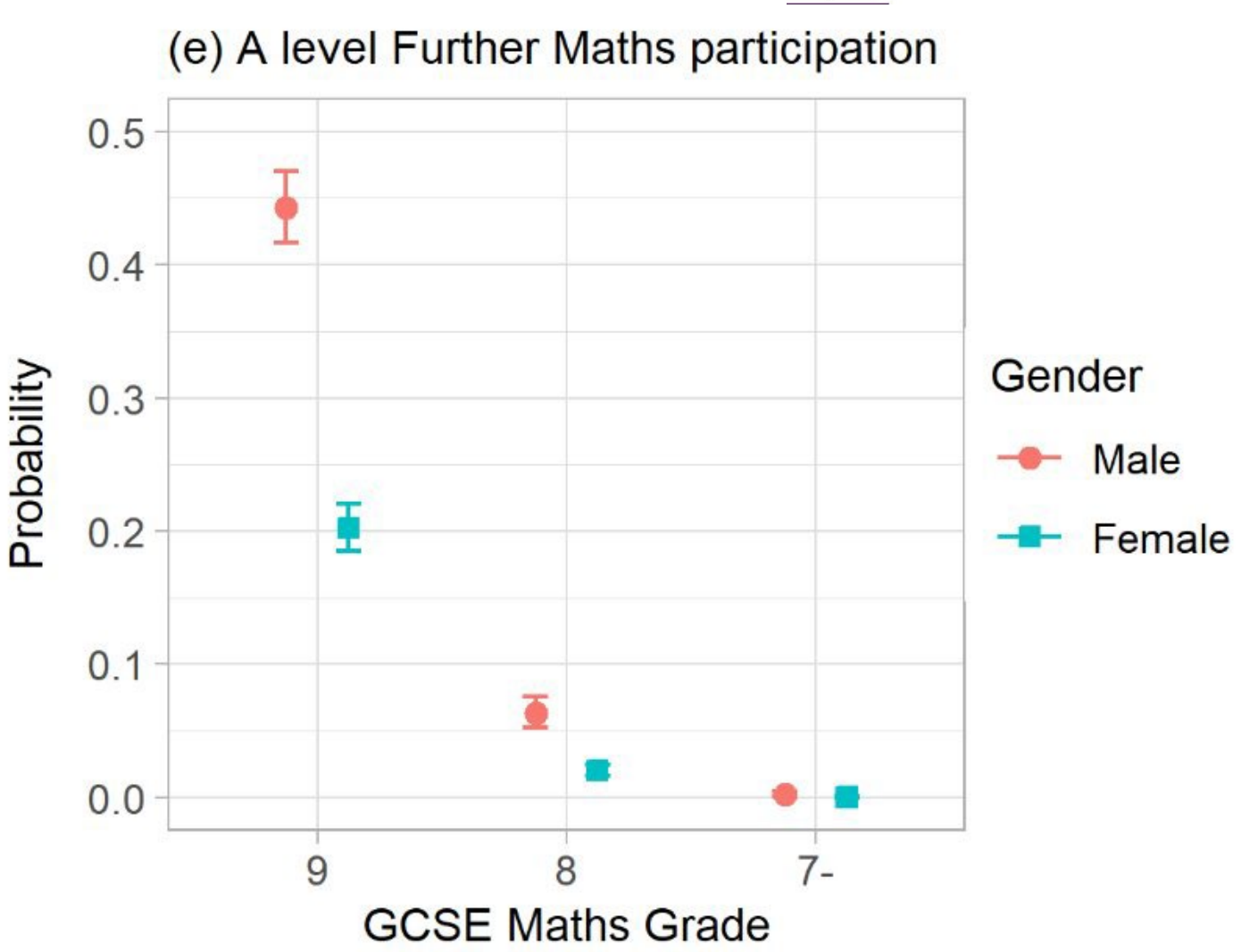
Working in a diverse team promotes personal and professional growth more.

Research found that when diverse teams made a business decision, they outperformed individual decision-makers up to 87% of the time.

To improve diversity, we must understand the pipeline into mathematics research

The ‘typical’* pipeline

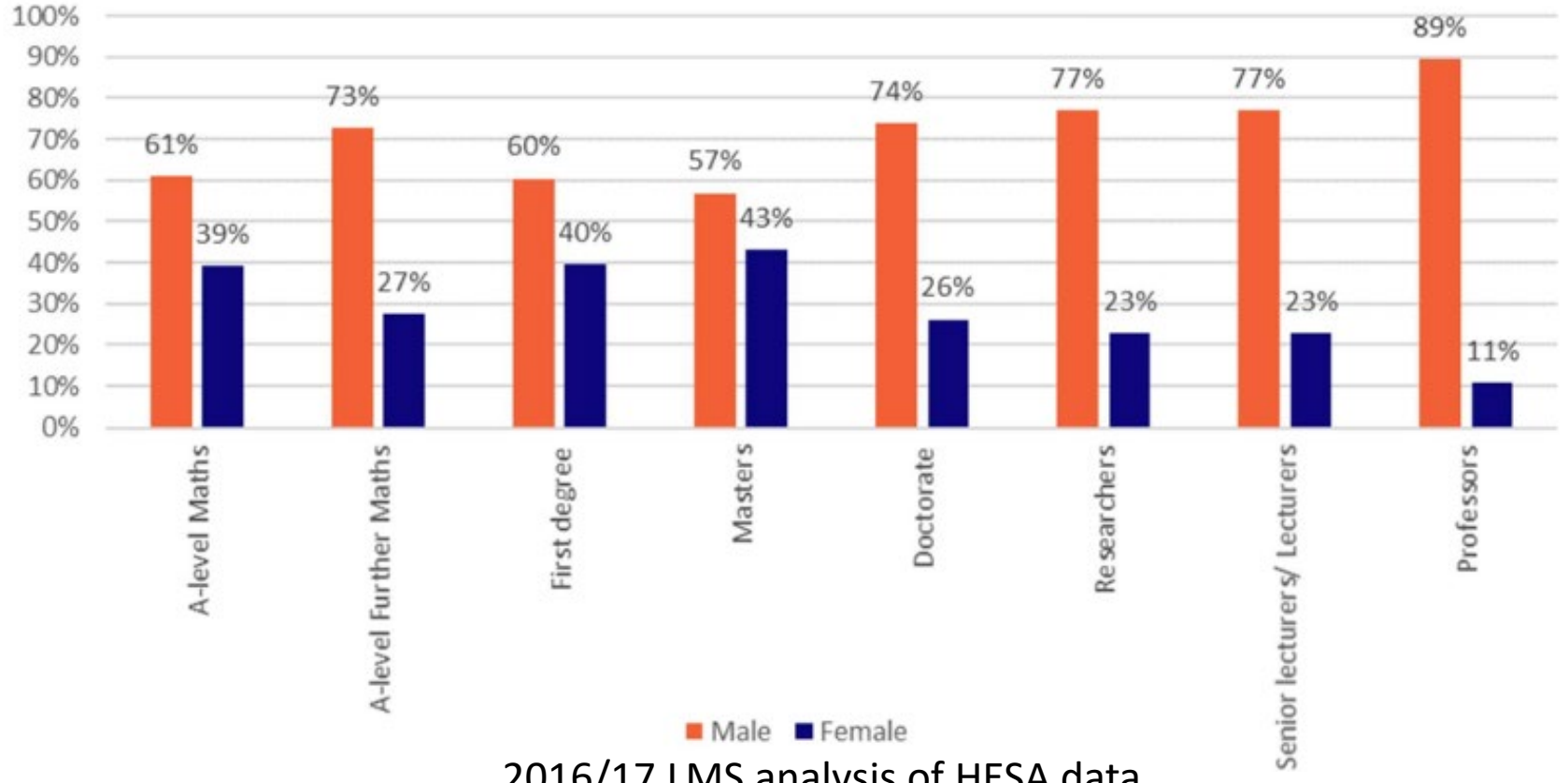




ing the fine grain results, in order to

Noyes, A., Brignall, C., Jacques, L., Powell, J. and Adkins, M., 2023. The mathematics pipeline in England: Patterns, interventions and excellence.

‘Who’s left’ or ‘Who’s missing’



2016/17 LMS analysis of HESA data.

HESA

22/23 academic staff

1455 female to 4245 male ~ 25% female

20/21 students

17,435 female to 29,560 male ~37% female

*This is sex data collected not gender so very limited

‘Who’s left’ or ‘Who’s missing’

- Females underrepresented
- Often sex data is collected over gender so we often miss experiences of non-binary and trans people in maths
- Certain ethnicities underrepresented e.g. Black professors make up less than 1% of science academics
- Low disability disclosure rates
- Data missing on LGBTQIA+ identities
- Those with caring responsibilities?
- Those that come from socioeconomically disadvantaged backgrounds?

- What about intersectionally- e.g. black women

Why do people leave?

Add to the Padlet why you think people may leave the mathematics research pipeline

Don't think they can sta

- Think there must be a reason no one like them has stayed
- Don't feel good enough
- Feel like they can't do it

ls

ship

- Poor work life balance

- Just want to do something else

Prevented from staying

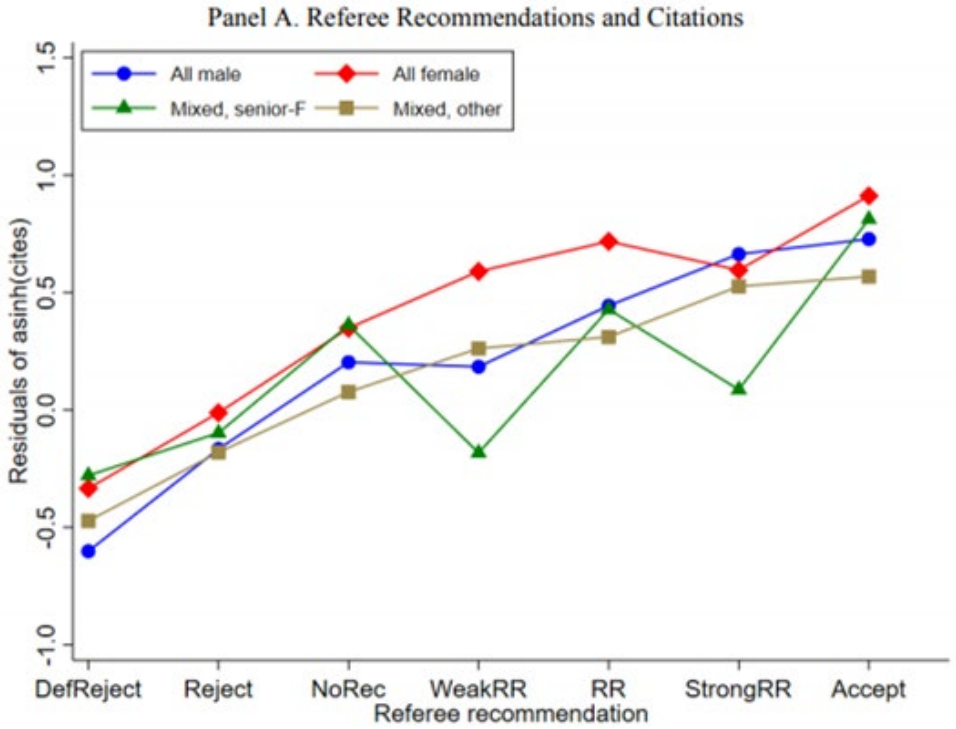
- Actively excluded e.g. not employed
  - Unconscious bias
  - Active discrimination
- Not given opportunities to progress
- Lack of job opportunities

Jackie Robinson Effect: Why the existence of many talented diverse academics is evidence of discrimination

If management is more comfortable with white players than black players, a black player has to be better than a white player to be considered.

For example:

- In 1968 black players at each position had higher batting averages than white players at the same position (Pascal and Rappling 1972)
- Female Members of the US Congress pass more bills and bring home more money for their districts than males (Anzia and Berry 2011)
- Patients seen by female doctors are less likely to die and less likely to be readmitted to the hospital (Tsugawa et al. 2017)
- Papers authored by female economists are cited more than papers by similar male authors (Card et al. 2020)



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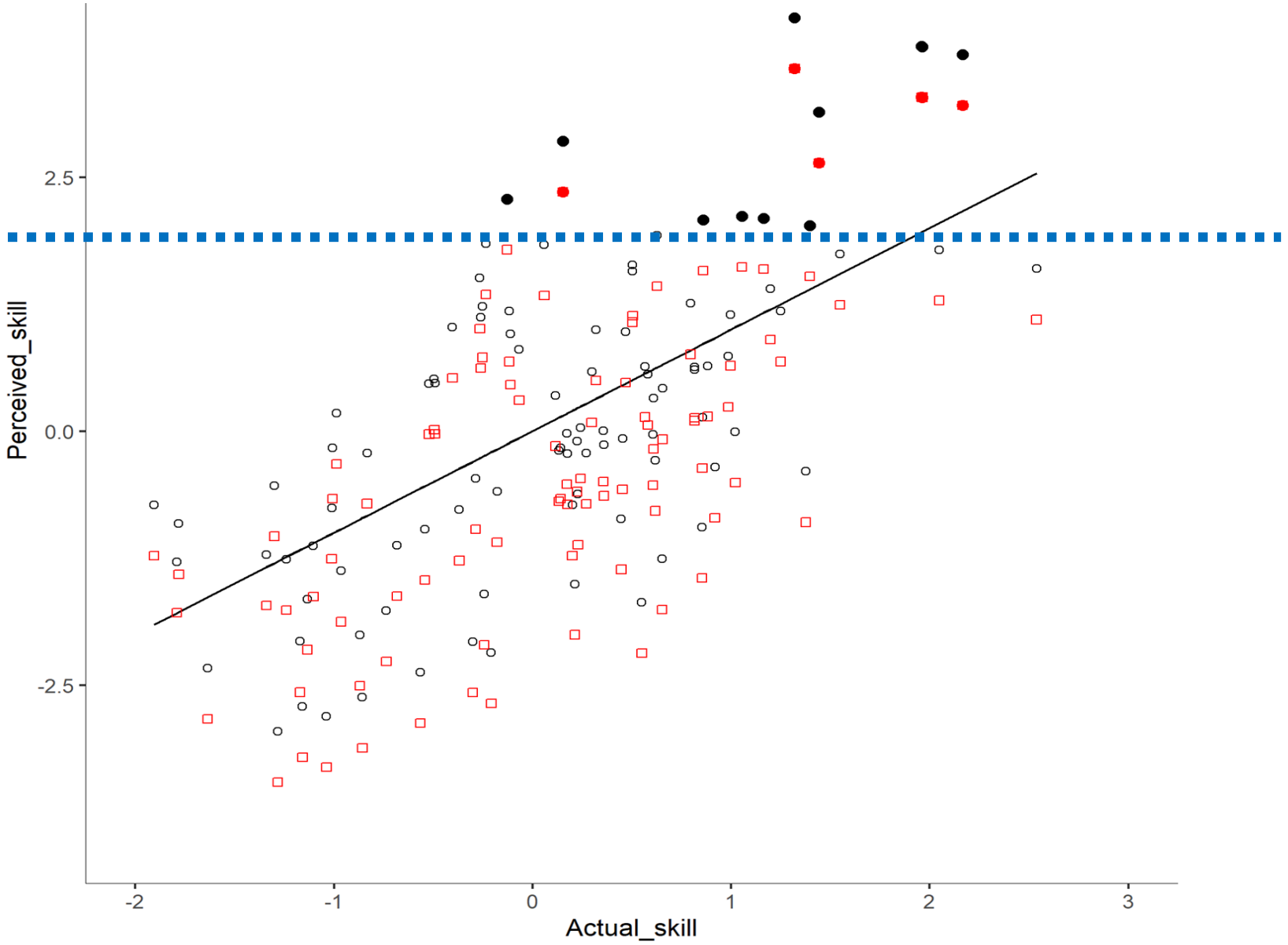


Figure from Susama Agarwala

So what can we do?

Carry on understanding the pipeline

We can’t just ask the people still in academia

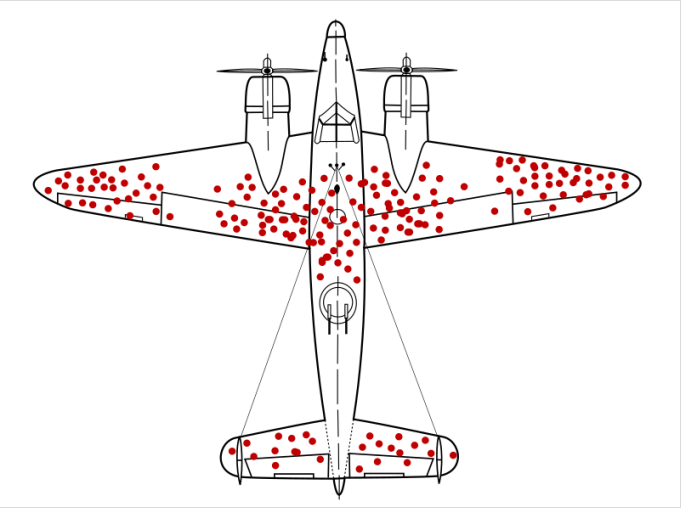
Survival bias:

In WW2 data was collected from aircrafts that returned and the damage they had Received.

Originally extra armour was added to where they had received more damage.

Later the strategy changed to add armour to places with least damage as these were the places if a plane was hit it would go down and not survive.

The data from the planes that survived wasn’t representative of the ones that didn’t.



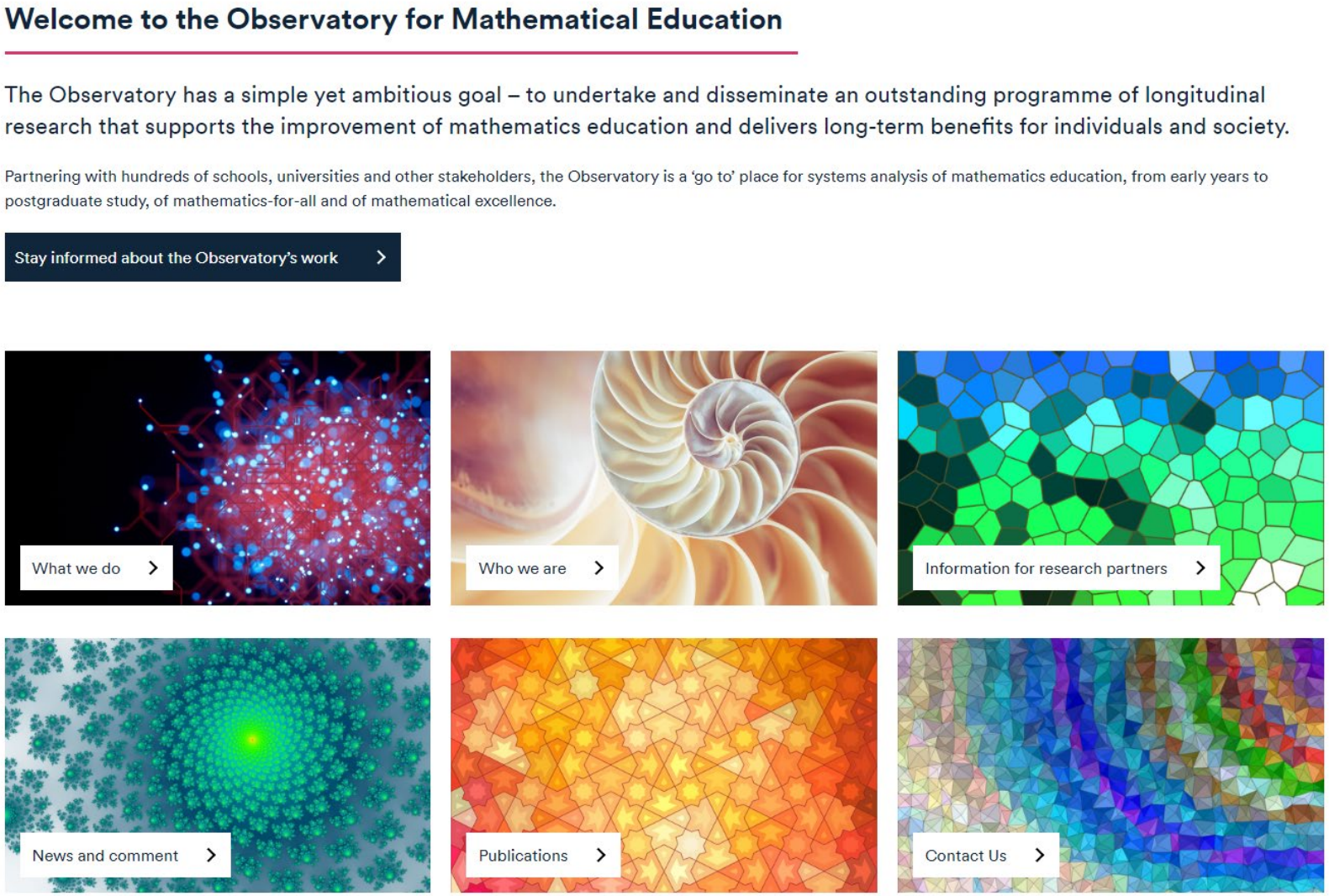
Systematic discrimination is a stochastic process.

It is impossible to say *which* highway accidents were due to inclement weather, only that inclement weather causes more accidents

Similarly it is difficult to prove whether a specific person was discriminated against in a specific instance, only that certain classes of people are *more likely* to face discrimination

Carry on understanding the pipeline

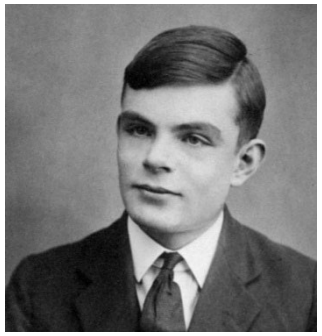
E.g. Observatory for Mathematical Education



Celebrate diversity

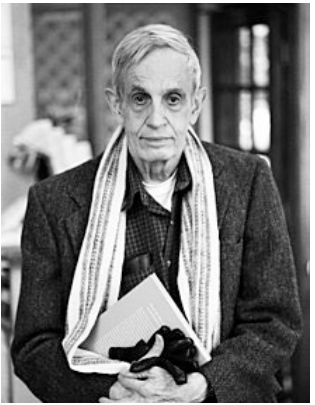
Sophie Germain (1776-1831)- mathematician and pioneer of elastic theory. Despite prejudice on her **gender** she worked independently on maths throughout her life.

Creola Katherine Johnson (1918-2020) – mathematician whose calculations were critical to the U.S. crewed spaceflights. Portrayed in the film Hidden Figures, she was an **African American woman** who refused to be limited by society's expectations of her race or gender.



Alan Turing (1912-1954) – mathematician considered to be the father of theoretical computer science. His work was crucial in cracking coded messages in the second world war and in doing so helped end the war. He was **gay** and sadly subjected to conversion therapy.

Maryam Mirzakhani (1977-2017) **-** mathematician working on the geometry of Riemann surfaces. She was the first **female** to win a Fields medal and also first **Iranian**.



John Forbes Nash Jr (1928-2015) – mathematician who made fundamental contributions to game theory, he was awarded a Nobel prize in Economics. He was diagnosed with **paranoid schizophrenia.**

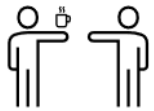
Ada Lovelace (1815-1852) – a mathematician who is often coined as the first computer programmer. Ada overcame adversity from her **gender** and leaves behind a great legacy.

Call out bad behaviour

E.g. Active bystander training

Direct Action

If you choose to take direct action – we show you how to speak up assertively and with confidence without being aggressive.



Distraction

If you go for distraction – we give you tools to take the sting out of any awkward situation. Distraction can often be more than enough to handle an awkward moment – and is very effective in contributing to positive culture change on a broader scale.

Delegation

Delegation is the option which involves telling someone else. We equip you with confidence building techniques and language tips to help you report unacceptable behaviours and escalate problems with integrity.

Delay

If you choose to delay your intervention, we share with you the benefits of waiting – and how to turn any hesitation on your part to your advantage.

The Active Bystander Training Company

Challenging antisocial behaviour at work, on campus and in school

Use recognition schemes

E.g. Athena Swan

- Look at what your data is telling you
  - Staff proportions
  - Student proportions
  - Compare to benchmarks
  - Rate of success from application to interview to job offer
  - Surveys
- Pick priorities - sadly you probably can’t fix everything all at once
- Create a realistic action plan that addresses the priorities
  - Give yourself time
  - Consult with others
  - Assign actions among all staff
  - Get buy in from those that will be responsible for actions
  - Think how actions can be sustainable

Use recognition schemes

Examples from our Athena Swan

Five identified priorities:

- Are making **students' experience** more inclusive,
- Contributing to diversifying the national **mathematical pipeline**,
- Improving inclusive **recruitment** practises,
- Improving inclusive **promotion and career progression** practises,
- Improving **EDI structures** within the department.

Example actions

Monitor and improve diversity of external speakers, form created for speakers to self report- the EDI committee don't have to issue this or check it as it is not within the seminar organisers role

EDI training needed to be on interview panel, EDI committee don't have to remind anyone/enforce this as it is a department rule and interview panel chair must check training has been done.

Share best practise

E.g. today! here are some things that have worked for me/ my department/uni

- Departmental EDI forums on particular issues/themes

What we did:

Each EDI forum will look at how us as a school can tackle a particular EDI challenge. They will be an opportunity to talk about what the problem is and also to suggest any ideas of how we can address the problem and improve it. These are open to everyone and you can participate as much or as little as you wish, you can come full of ideas (that would be great!) or you can come just to listen, any involvement will be appreciated!

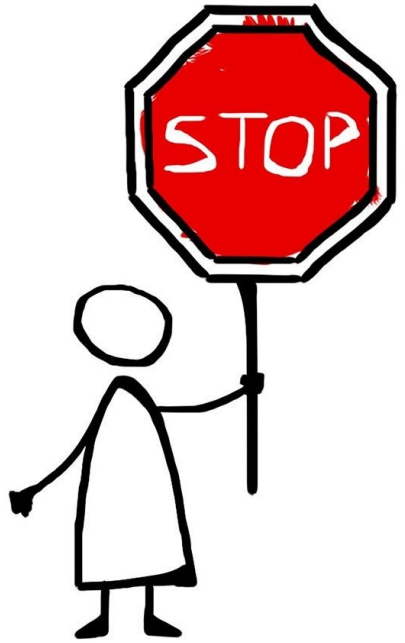
I emphasise as well that these meetings are not just for those affected by the problem but open to all staff - **you do not have to be part of the problem to be part of the solution**!

- Make outreach resources to encourage staff to participate more- including an outreach buddy scheme

- Clear reporting systems

How? Reporting systems

- Being able to easily report an EDI issue is really important (often particularly highlighted in race equality charters)
- There should be option for anonymous reporting
- It should be a clear and transparent process
- The right people should be dealing with reports
- It may well be that the report system is centralised with a university not a department in which case departments should clearly advertise this



https://pixabay.com/illustrations/stop-drawing-icon-cartoon-1207069

How can I help as an individual?

- Challenge yourself
- Be willing to change your opinions
- Be a role model
- Accept if you make a mistake- apologise and learn from it
- Standing up to peers
- Be an active bystander

- Learn, admit and act against unconscious biases
- Avoid living in an “echo chamber” –only encounter beliefs or opinions that coincide with own – so your existing views are reinforced and alternative ideas are not considered.

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Thank you for listening

katie.severn@nottingham.ac.uk