Internationally, there has been considerable research to identify more sustainable practices in pharmacy – an International Pharmacy Federation development goal (aligned with UNESCO Sustainable Development Goals and 1987 Brundtland definition of sustainability) – but this does not appear to be reflected in Irish community pharmacy practice. Moreover, previous research has mainly focused on developing sustainability measures, not investigating uptake, so barriers are unclear, although limited awareness of practical steps may be a factor. An environmentally sustainable health system is defined by the WHO (2017) as one that 'would improve, maintain or restore health, while minimizing negative impacts on the environment and leveraging opportunities to restore and improve it, to the benefit of the health and well-being of current and future generations,' forming this project's basis.

The aim of my research project was to explore and improve awareness and uptake of environmental sustainability measures by community pharmacists in Ireland. The primary objectives were to determine pharmacists' current awareness and use of environmentally sustainable practices, to identify facilitators and barriers to their uptake and to design and disseminate a resource to raise awareness of potential measures and address barriers to implementation.

I conducted a grey literature review using an internet search on the current guidance on environmental sustainability in healthcare available in Ireland, the EU, and worldwide. This formed the core of my interview guide and questionnaire questions. It also informed most of the ideas for the guide I produced, alongside the insights of the pharmacist participants.

I conducted a questionnaire online using SurveyMonkey. This questionnaire asked pharmacists about their current sustainability efforts in community pharmacists and the barriers to the measures they had not put in place. 101 responses were received. I sent out a call for interview via cold email, after receiving permission from my data source, the Pharmaceutical Society of Ireland. 7 pharmacist participants and one general practitioner (recruited by cold call) were interviewed over 15-20 minutes each about their awareness of

environmentally sustainability in pharmacy, the current barriers they experience and what solutions they may have to work around these barriers.

I used SPSS IBM Statistics to analyse the data from the questionnaires and QDA Miner Lite to conduct thematic coding of the interviews using constant comparison. The results were recorded in an academic writeup and were used to influence the guide produced as an output of the project. The guide was formatted to be viewed as a PDF document.

The final findings of my project were that although community pharmacists are interested in environmental sustainability, and in particular, minimising waste, they face many barriers to the integration of measures such as those identified in the short literature review conducted as part of this project.

Literature review: the preliminary, grey literature review focused on environmental sustainability-focused guidance for pharmacy which was applicable in Ireland. This information helped form the guide produced for pharmacists as an output of this study. The guide was split into five parts: patient counselling, medicines choices, waste management, pharmacy equipment, training and workplace. The literature review combines both evidence for the environmental impact of different aspects of pharmacy practice, and resources to become more environmentally sustainable. One of the most important aspects of the literature review and this study, is to draw pharmacists' attention to the guidance and resources they can access and implement as is accessible to them. The guidebook produced attempts to approximately rank measures from simplest to most complex task. There was no formal guidance found focusing specifically on environmental sustainability for community pharmacists in Ireland.

Interviews:

Figure 1: coding tree outlining themes, categories and codes from analysed interviews

All participants were interested in sustainability, using technology and waste segregation to make practice more sustainable. They also reduced the number of unnecessarily dispensed medications through patient counselling and encouraged medicine return. They lacked clear access to guidance and still were legally required to print receipts. Patients stockpiling medicines was a large source of waste. Another barrier to sustainability was lack of training available. Legislation prevented medicine reuse or donation, and lack of time reduced the capacity for patient counselling on waste reduction and rational medicine use. Facilitators mentioned included reduction in packaging volume at manufacture, training for pharmacists and pharmacy staff, collaboration with prescribers and hospitals pharmacists to streamline prescriptions, and increased patient awareness. Based on the interviews, it is clear that pharmacists are not unduly wasteful in their practice but may not always be aware of the sustainability benefits of practices they already commonly undertake; it simply had not been a priority within their practice. Several of the interview participants specified the need for such top-down support, including financial incentivisation, and pharmacist insight.

Questionnaires:

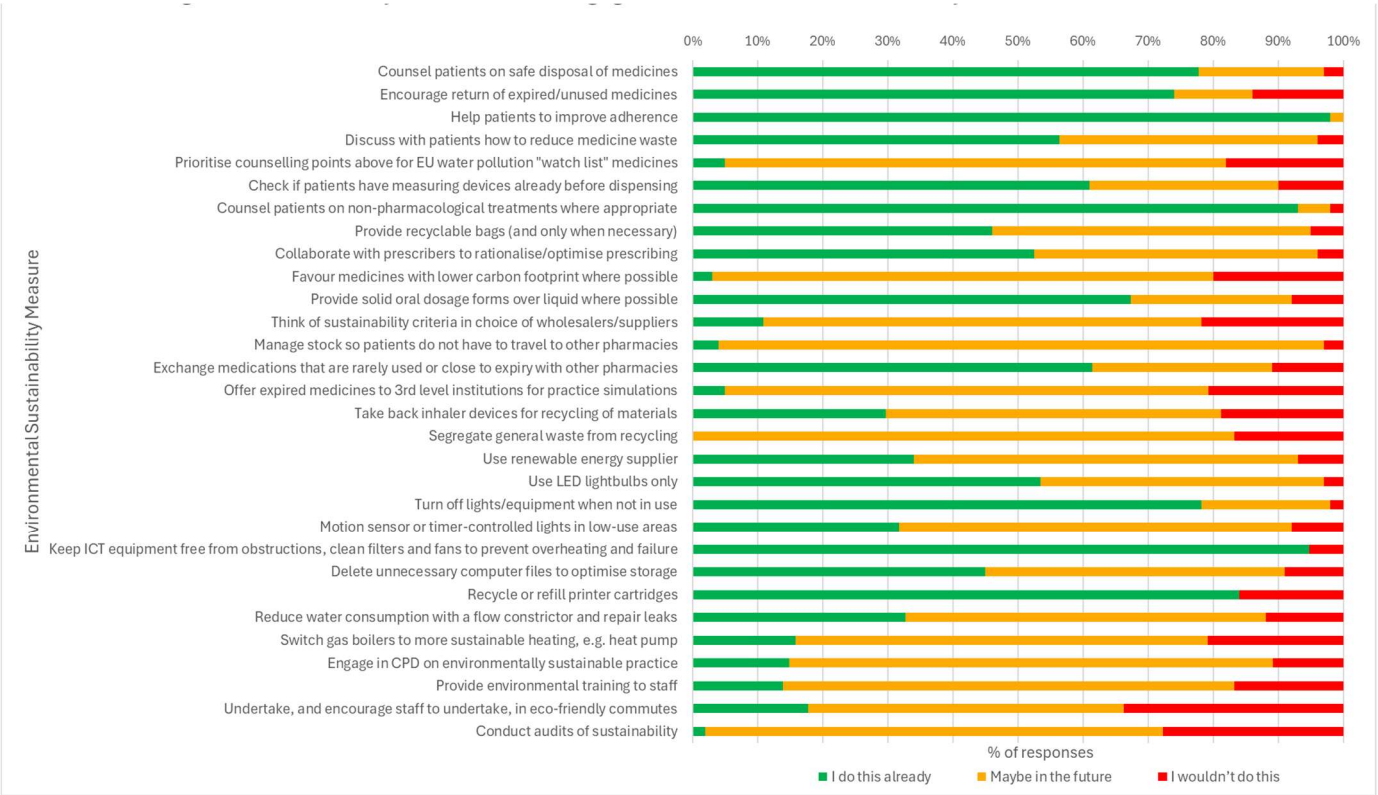

Figure 2: Willingness of community pharmacists to engage with environmental sustainability measures

a.

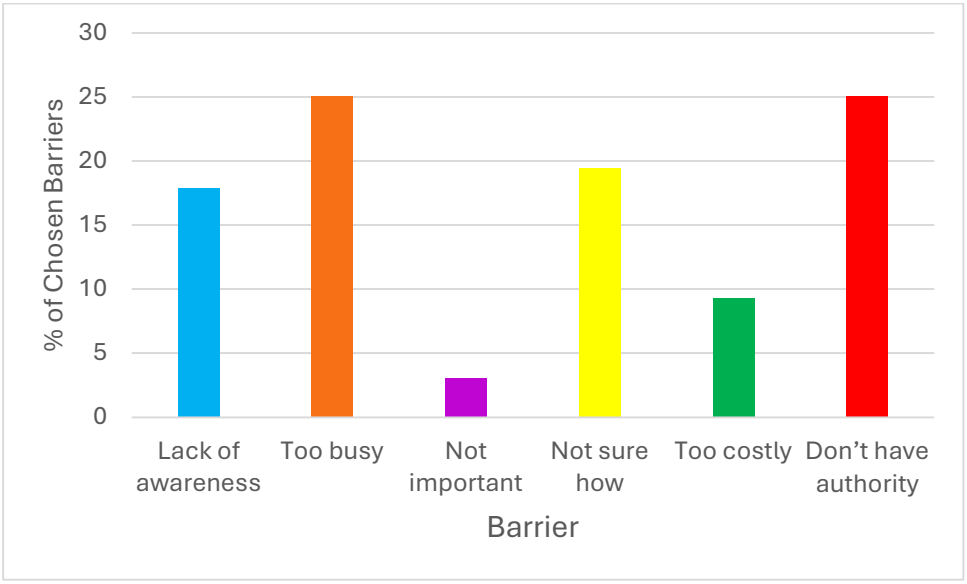

Figure 3: Barriers to environmental sustainability measures in community pharmacy according to community pharmacist respondents

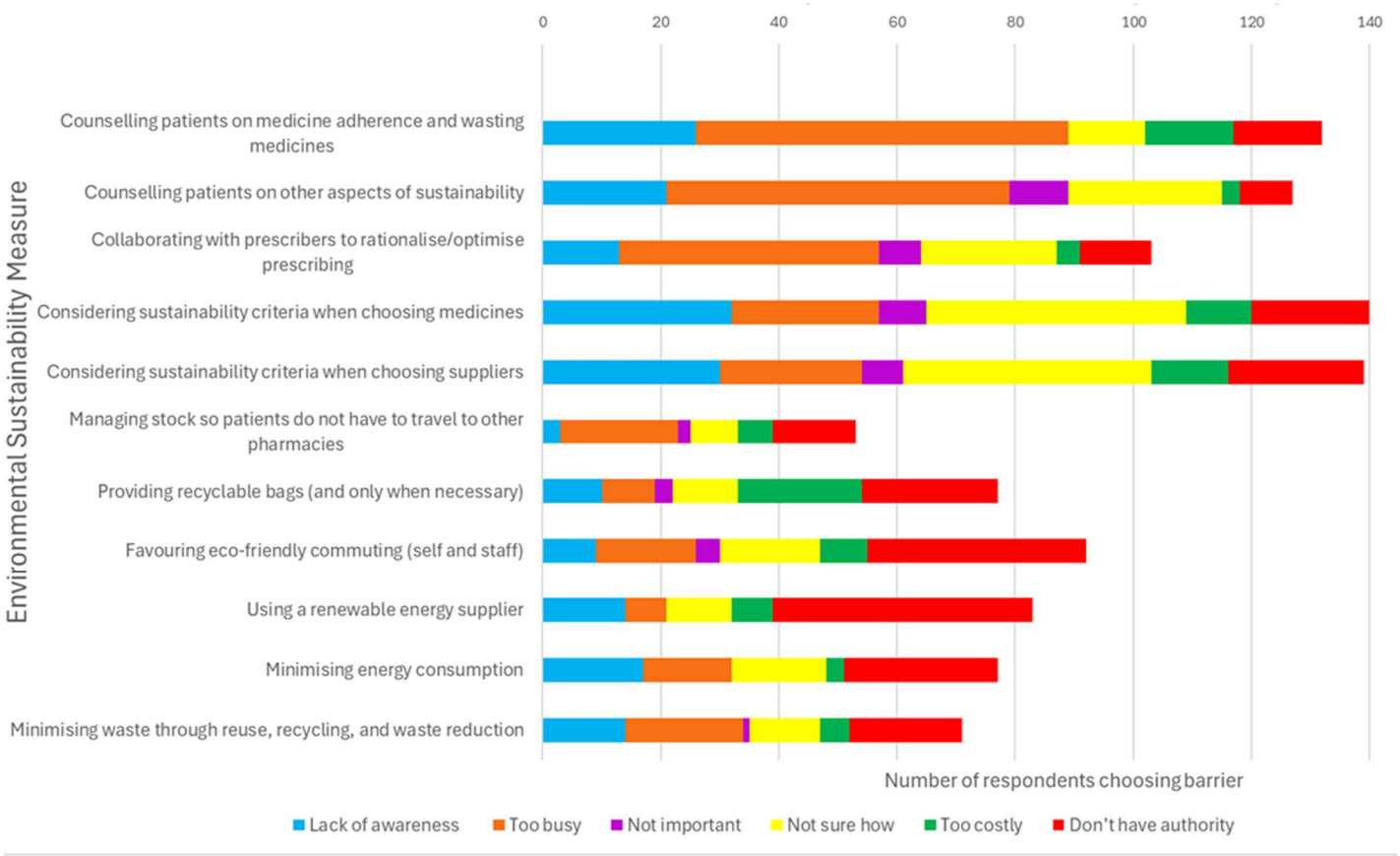

Figure 4: barriers to implementing environmental sustainability measures in community pharmacy, based on sustainability measures.

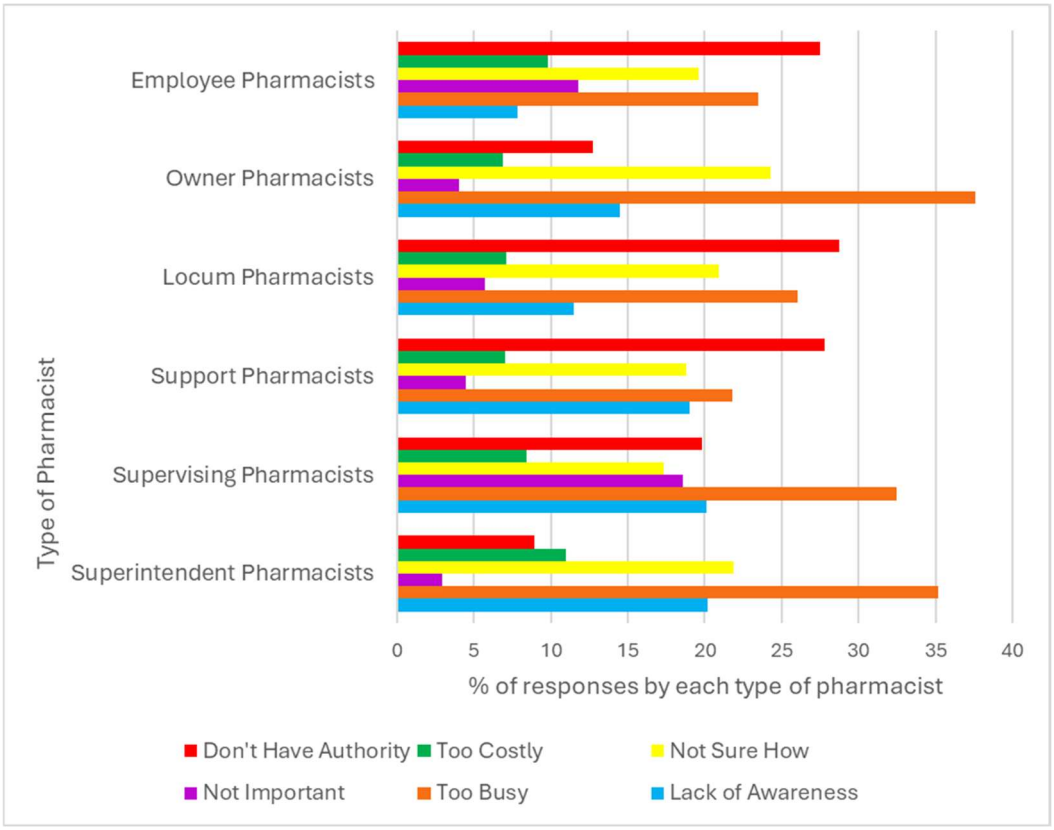

Figure 5: Barriers to environmental sustainability measures based on type of pharmacist.

A ‘Total Sustainability Measure Score’ was calculated by giving 1 point for responding ‘I do this already’, 0.5 for ‘Maybe in the future’ and 0 for ‘I wouldn’t do this’. This gave a maximum score of 30. No weight was given to sustainability measures with smaller or greater impact. The scores were negatively skewed, with a median of 20.5 and a range of 20.

77.7% of those who answered ‘Don’t have authority’ were women (63.7% of respondents), whereas only 9.5% of these respondents were superintendent pharmacists (30.7% of total). Superintendent pharmacists made up a small 15.6% of ‘not important’ selections were made by superintendent pharmacists and supervising pharmacists (27.7% of total respondents) made up 9.4% of these responses.

Results of the questionnaires indicated that:

- Reducing medicine waste is not obviously present in pharmacy regulations or practice.
- There is an outlook shared by pharmacists, that patient safety comes first, above environmental sustainability.
- There is an interest among pharmacist to choose sustainable suppliers, but they perhaps do not know how.
- Superintendent pharmacists are concerned for the legal implications of exchanging medicines.
- There is requirement for increased promotion of activities like reuse of medicines for simulations in institutions.
- The large capital expense often associated with upgrades like solar panels is prohibitive.
- Only half of pharmacists use LED lightbulbs.
- Pharmacists seldom have the time or authority to implement environmental sustainability measures.

- Women make up most locum and support pharmacists and therefore more frequently do not have authority.
- The responsibility of cost is on superintendent and supervising pharmacists and that this a concern they have regarding the implementation of new measures in the pharmacy.
- Pharmacists need training on counselling patients on medicine adherence and waste.

In retrospect, I focused more on the barriers in my data collection than on participants' awareness of sustainability measures. As the project developed, it became clear to me that the focus should be barriers to implementation – practical measures and help for pharmacists became my priority, to make sustainability as accessible as possible. In the end, a small number of pharmacists expressed interest in an interview. This meant that the grey literature review conducted at the start of the project became a greater focus of the guide produced. As well as that, it highlighted the need for simple, easy guidance on the topic, as pharmacists did not appear to have the time or interest to engage in an interview. Ultimately, I completed the necessary grey literature review, engaged with pharmacists through interview and questionnaire, and produced a guide to help incorporate environmental sustainability into their practice – achieving all the critical goals I set out to reach.

In my view, the next step for this research is to quantify the environmental impact of healthcare, and in particular, community pharmacy, and measure the positive effect that sustainability measures in a community healthcare setting would have. It is also essential to make guidelines and infographics, for regular use in community pharmacies, general practice surgeries, and further afield throughout primary care. The rollout of publicly funded initiatives like a medicine take-back scheme for community pharmacies is a crucial step in sustainable healthcare in Ireland, to make real change following research like this.

The significant achievements of the research project were mainly honing my skills in research. I learned how to conduct a broad literature review, write questionnaires, conduct interviews, use coding software. I learned how to carry out thematic analysis and attempted academic writing for the first time. I investigated graphic design, studied academic poster design and made a digital guide and academic poster for the first time. The greatest challenges were working independently, managing my time, being isolated while working alone, trying to learn new skills in such a short period, and facing delays while waiting for approvals from different bureaucracies. I learned that my passion in research centres around people, rather than science. I have realised that my area of interest is improvement of service provision in primary care. This has made me truly enthusiastic for the future, when I can continue to devote time

to this. I was surprised by how interesting I found the actual research, data collection and data analysis processes (in spite of how lonely I found it). Learning how to use the different software, from video calls to transcription to thematic analysis to coding, was challenging yet useful and stimulating. I was pleasantly surprised by how confident I grew in my ability to conduct analysis and interviews. Staying resilient through difficulties proved to me how determined I was, and every time I faced a setback, this is what I focused on to push through. I was taken aback by how difficult it was to conduct interviews at first. Although I loved consulting with peers and experts, remaining quiet and unbiased during conversation was tricky for me. I also learned that I gain the most energy from working with other people, and being a solo researcher doesn't suit my personality or strengths the best. I am more efficient when I can help others and obtain help from them. I was a lot happier conducting interviews than doing a literature review for this reason. I also concluded that this can be of huge benefit – I love speaking with people, experts and peers, and forming relationships, which can then be useful to the development of a project. My leadership style focuses on collaboration – one of my greatest leadership skills is the ability to draw out the best of people and situations and bring them together to make the best project possible. My supervisor Sheila's leadership style was constructive too – I found she maintained a great balance between supporting me fully, putting me at ease without making me feel incapable. It was both motivating and confidence boosting, and she was always able to take her hands off the reins to let me improve my skill set.

The engagement process was incredibly easy with my supervisor. As well as weekly check-ins, she was always happy to answer a quick email, clarify when I was confused, provide interesting sources, connect me with relevant parties and check on my progress, and even my wellbeing. She was kind, engaging and motivating at every turn. I engaged with several other people and parties connected to my research. Dr Cristín Ryan is the TCD lead for their 'Green Pharmacy' project – she was pivotal in connecting me to other groups and experts in the environmental space. Dr. Cicely Roche is part of the team designing a sustainability curriculum for Trinity. She lent her expert opinion to help me refine the design and methodology of my research. Collaboration and teamwork both played crucial roles in the outcome of my project. I collaborated with the PSI (my data source) to complete the Data Protection Review. Teamwork

became essential between myself and my supervisor, especially when under time constraints to produce outputs, e.g., materials for ethics review, data analysis. I stayed in constant communication with Sheila, who in turn answered my queries and lent her expertise whenever it was required.

I did not (yet) achieve every goal in my PDP. For one, I have not yet had the chance to publicly present my work, as I only just finished it, and thus did not have opportunity to gain confidence in my public speaking or convince others of the importance of my results. Due to factors outside my control, I did not finish the project in June – I finished at the start of September. I did, however, collaborate with others on my project, and asked for help and expert advice that gave me much richer outputs than I would have had otherwise. I also managed to adapt when needed to change the timeline, goals and outputs of my project as it grew, developed and faced setbacks. I also learned how to conduct thematic analysis, as well as use different coding software to analyse the data I collected, and was proud to have acquired this new skill set.

In summary, my project was successful and meaningful, not in the least because of how much I grew over the summer as a researcher, a leader and a person.