

IMPERIAL

Research Methodologies in Public Health

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Abstract

Introduction: Robust research methodology is vital to address complex, real-world challenges in public health. This project explores the strengths, limitations and impact of diverse research methodologies for different research questions. *Methods:* The impact of mobile phone use on grip and pinch strength in adolescents is explored via a quantitative observational prospective cohort design; a mixed methods qualitative and quantitative study with modified Delphi, focus group, iterative survey and nominal group techniques is used to determine the core outcomes for a large intervention study of school attendance and sexual harm; and secondary research techniques are explored via a systematic review on digital health technologies in the form of mobile applications for dementia care, a peer review of a cross-sectional national survey and secondary data analysis on UK health deprivation, a narrative review and synthesis of multi-disciplinary perspectives and priorities from UK and USA school absence workshops, and a review of public health research methodologies. *Results:* This research scholarship highlights the complementary nature of quantitative and qualitative methodologies in achieving holistic insights into complex public health issues, their relative strengths in determining causality, and differential impacts on bias, as well as the power of breaking down research stereotypes, engaging youth, gaining trust for research in vulnerable populations, and flexibly co-designing interventions within communities in qualitative methodologies. *Conclusions:* Methodologies must continually evolve to deliver effective, ethical and inclusive public health interventions, prioritising complexity, adaptability and real-world applicability with scientific rigour. Results are published in the Royal College of Paediatrics and Child Health, International Medical Student and Laidlaw Conferences and via written publications in the Archives of Disease in Childhood, International Journal of Medical Student and InnovAIT journals.

Project Summaries

In Summer 2025 I had the incredible opportunity to work with Imperial School of Public Health experts on diverse research projects addressing major challenges in public health: dementia care, school absence, sexual harm, and the impact of mobile phones on adolescents. A brief outline of these projects is given below:

A prospective cohort study to explore the impact of mobile phone use on hand grip and pinch strength in adolescents

Use of mobile phones demands small, repetitive movements of the thumb and digits on small screens with prolonged hand grip and awkward wrist movements, which may result in fatigue, discomfort, weakness or musculoskeletal impairment. The impact of phone use on the hand grip and pinch strength of adolescents is poorly understood with existing research limited to small, cross-sectional studies in young adults, with poor adjustment for confounders. Yet hand and wrist injuries pose a huge economic burden to the NHS, costing c£1.3 billion annually with an average 2.8 days of workdays lost. This high quality, longitudinal prospective cohort design with analyses that adjust for confounders enables temporal relationships and causality to be inferred. This research question is important, given the high levels of smartphone use in UK adolescents, and results will be published at the IJMS WCMSR conference 2025.

A qualitative study using modified Delphi consensus methodology to establish outcomes for an intervention study of school absence and sexual harm

School absence is a major concern after the COVID-19 pandemic. Overall school absence rates have risen in England from 4.7% in 2018/9 to 6.9% in 2024/5 with severe absence soaring by 187%. One in five pupils were persistently absent from school in 2022/23, missing ten percent or more of classes. School attendance predicts long term educational, health, economic and social outcomes in children and young people. This project qualitatively explores the optimal outcome set for a large study on school absence and sexual harm. Nominal group technique was used to shortlist a candidate outcome set and iterative Delphi survey rounds to achieve consensus. Co-design of interventions with young people ensured that language was positive, trauma-informed and clear. Pre-Delphi results were presented at the Association for Young People's Health Conference 2025, and an abstract was submitted to the RCPCH Conference 2026, and a core outcome set for a large national intervention set was determined.

Peer review of a secondary data analysis from a national prevalence survey

This study addressed an important research question relating to provision of services in areas of health deprivation, and filled an evidence gap in the literature. Its methodology was limited by the narrow scope and precision of survey items, subjective endpoints, and a lack of control for confounding variables. Potential sources of bias were not openly discussed, causality could not be inferred from the cross-sectional study design, and secondary data analysis limited the conclusions that could be drawn.

A narrative review of school attendance barriers and themes from MDT workshops

Regular school attendance is vital for the educational, health, economic and social outcomes of most children and young people, yet school absence remains a major UK issue post COVID-19, with one in five pupils persistently absent or missing more than 10% of school in 2022/23. School absence disproportionately affects children with poverty, socioeconomic disadvantage, social, emotional or mental health needs, special educational needs and disabilities, bullying, or adverse childhood experiences. This narrative review explores the role of paediatricians and other child health professionals in school attendance, synthesises perspectives on school absence of multidisciplinary experts at the Imperial Public Health School Absence Workshop, and the John Hopkins Bloomberg School of Public Health 'All in for Attendance' Summit and reviews policy and research interventions to address absence. Key priorities addressing school absence are identified, using attendance data as an indicator of student and system wellbeing, strengthening health, education, third and social sector collaboration and creating strengths-based attendance policies and programmes. The narrative design offered flexibility, permitting greater exploration of many complex, cross-sectional issues and views. The conclusions are summarised in an article for the 'Archives of Disease in Childhood' journal.

A systematic review on the impact of mobile digital health technologies in dementia and mild cognitive impairment

Dementia affects one million people in the UK with care costs currently exceeding £42 billion and expected to rise to £90 billion by 2040. This systematic review evaluates the impact of

digital health technologies in the form of mobile health applications on dementia care. It aims to provide high quality evidence with minimal bias, synthesising existing literature, to provide a background for an intervention trial. The Cochrane Interactive Learning Platform offered skills, tools and techniques for the research, and an information specialist supported a precise, rigorous and reproducible search across multiple databases including foreign language papers. A PROSPERO protocol (CRD420251139512) was published to improve transparency, enable peer scrutiny and to prevent research duplication. Dual screening improved accuracy and minimised bias during title, abstract and full paper review. Covidence software streamlined decision-making, conflict tracking and quality assessment. A PRISMA summary and systematic review was formulated. Full results will be available on publication.

Reflections

The Laidlaw Scholarship has facilitated my understanding of diverse research methodologies and their applications in public health. Through the exploration of quantitative and qualitative approaches, primary and secondary research, I have understood the tools and techniques that facilitate a holistic understanding of complex research issues, their frameworks, strengths and limitations, and their impacts on clinical care. I have learned how methodology underpins the validity of clinical research, and how bias and confounding affect the reliability of outcomes. Research engagement and understanding of methodologies is crucial for clinicians to critically appraise literature, to design high quality, real-world studies, and to effectively answer clinical questions for provision of optimal patient-centred, evidence-based care.

Classifications of research evidence map study designs by research categories (descriptive or analytical, observational or experimental), enabling clinicians to design studies that answer, most effectively, their clinical questions. The hierarchy of research evidence provides a further aid, ranking study designs by their strength of evidence and susceptibility to bias. Systematic reviews and meta-analyses are situated higher in the evidence hierarchy, providing stronger evidence. Anecdotal evidence, expert opinion and case reports are situated at the base with weaker strength of evidence and higher susceptibility to bias.

It is easy to view designs at the top of the pyramid of evidence hierarchy as superior, but my Laidlaw Scholarship has highlighted how research methodologies are all complementary and vital for holistic health insights. Qualitative methodologies capture in-depth lived experiences, dynamics, health beliefs and behaviour patterns; the 'how' and 'why' type research questions, facilitating an understanding of the meaning and context of complex dynamic phenomena. They permit hypothesis generation or determination of outcomes for later quantitative study and offer flexibility for full thematic or narrative analysis with their open-ended exploratory methods, interviews, focus groups and participant observations. Quantitative methodologies, in contrast, use standardised methods and statistical analyses, trial, test and survey methods, with higher objectivity, reliability, and generalisability, and are vital to determine effect sizes and the statistical significance of results. They answer the 'what,' 'when,' 'how many' or 'how often' type of research questions, using numerical data and measurable outcomes but without flexibility, context and depth.

Traditional research methodologies, such as the randomised controlled trial, have always been considered the gold standard of public health research, with high internal validity and low bias

due to randomisation and blinding, but whilst valuable, randomised controlled trials often lack external or real-world validity, oversimplifying complex systems with interacting variables and side-lining key insights from observational or quasi-experimental research. They are often infeasible due to restraints on time, cost and resources, and cannot respond to public health crises requiring rapid insights and action, or population-level interventions. RCTs often exclude vulnerable populations and cannot explain the context in which interventions fail.

Methodological pluralism, strategically integrating qualitative, quantitative, participatory and systems approaches flexibly alongside interdisciplinary expertise, is vital to address complex, multi-layered public health challenges, which are rooted in biology, behaviour, policy, culture and power. Design frameworks that combine methods over time and understand the detailed community-specific and nuanced realities of complex health situations in real-life settings are advantageous, for relevant, actionable insights.

Ethical public health research thus demands that methodologies are chosen not just on rigour, but on inclusion, context and complexity, with the voices of affected communities heard. Co-design and knowledge production with communities, adapting research methods to cultural contexts and valuing non-traditional evidence is important. It is vital to know as researchers, not just what works, but how, why and under what conditions interventions succeed or fail. Flexible hybrid designs, evaluation of processes and continuous feedback loops should be core components of public health research to ensure that the feasibility, adaptability, sustainability and relevance of interventions is established alongside their efficacy.

We must also keep pace with social and digital change, rising to the challenge of digital, AI and social media driven behaviour and misinformation. Innovative, interdisciplinary future labs for methodological research should test novel tools and approaches such as digital ethnography, real-time analytics or adaptive trials, in public health research.

Conclusion

Public health methodologies must continue to evolve from rigid evidence hierarchies towards flexible, inclusive and context-sensitive methodologies with rigour re-defined to encompass real-world relevance, responsiveness and ethical accountability. Researchers should combine methods to address causality, inclusivity and context; funding bodies should aid participatory, adaptive, and systems-informed designs, incentivizing innovation; journals should recognise impactful non-traditional methodologies, and educators should offer systems thinking, digital methods and critical reflection training. All evidence with real-world relevance should be considered when determining future public health policy.

Acknowledgements

I wish to express my sincere thanks to all my supervisors in the Departments of Public Health and Primary Care at Imperial College, London, for their immense expertise, time and support during this Laidlaw Scholarship Programme.

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Figure 1: Research Classification Table
(Goshen, 2025)

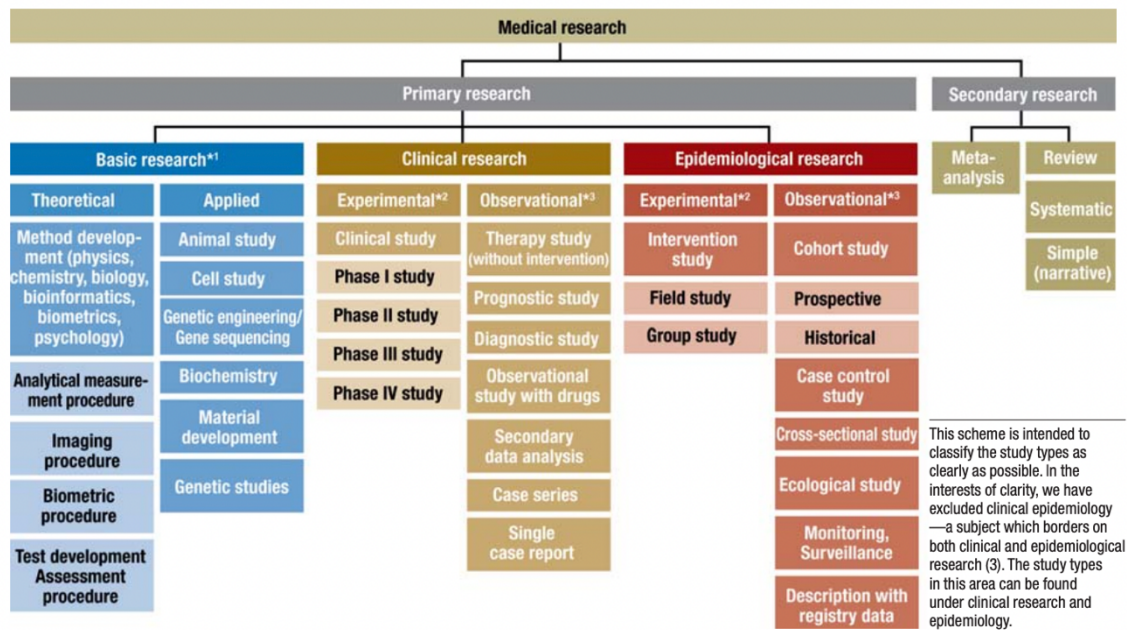


Figure 2: Research Evidence Hierarchy
(Haynes, 2006)

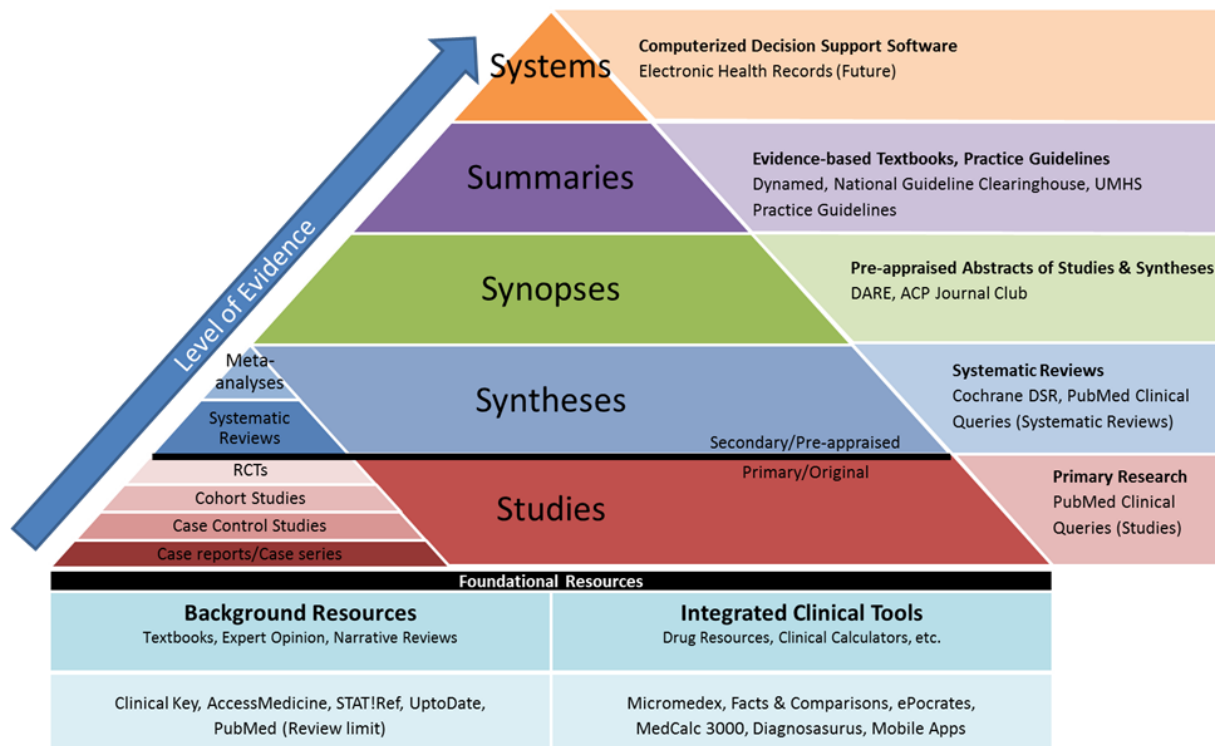
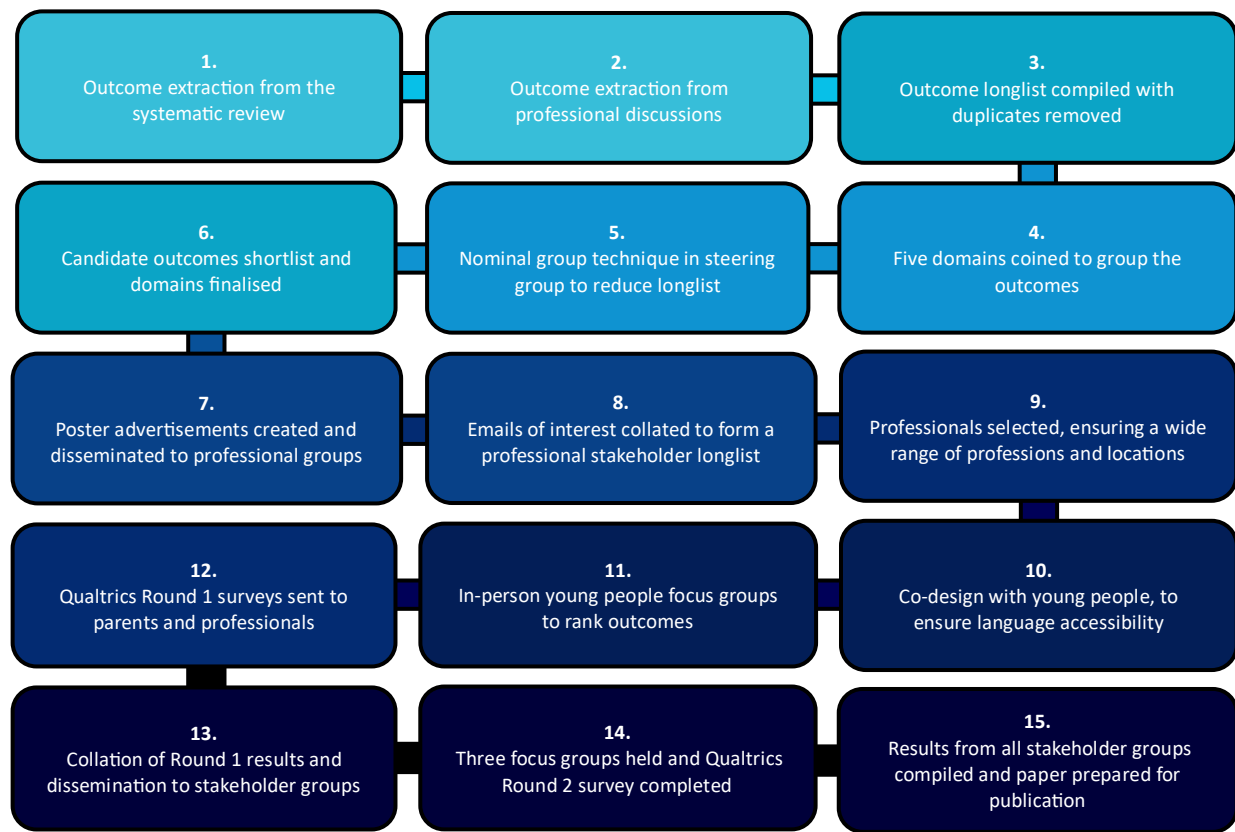


Figure 3: Modified Delphi Method



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