Concept Paper

Provisional Paper Title: Consolidating the pharmaceutical persona: the emergence of polypharmacy by midlife

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P.I. Sponsor: JM Broadbent
(if the proposing author is a student or colleague of an original PI)

Today's Date: 4/11/21

Please describe your proposal in 2-3 pages with sufficient detail for helpful review.

Objective of the study

The objective is to characterise age-associated changes in medication use, with particular attention to the emergence of polypharmacy (and to dry mouth), and to determine the influence of the pace of ageing on changes in medication use.

The work described here is likely to result in two published papers.

Data analysis methods

(1) Identification and description of medications taken by the cohort (along with whether each is prescribed or OTC);

(2) Determination of polypharmacy prevalence at each of ages 26, 32, 38 and 38, along with characterising the nature of polypharmacy at each age (that is, what are they taking, and how does that change over the four observations?);

(3) Modelling the occurrence of polypharmacy by age 45, controlling for sex, SES and the pace of ageing; and

(4) Characterisation of changes in xerostomia prevalence with age (identifying incidence, persistence and remission) and their association with medication use.

Variables needed at which ages

Medication data from ages 26, 32, 38 and 45 (I already have those).

Xerostomia variable from ages 32, 38 and 45. I have the first two but not the latter.

Pace of ageing variable(s).

Significance of the Study (for theory, research methods or clinical practice)

Polypharmacy is defined as the taking of five or more medications, whether they have been prescribed or purchased over the counter or online (Masnoon et al, 2017). Since ageing is associated with progressively greater multi-morbidity (concurrent long-term health problems), people tend to take more medications as they age (Page et al, 2019), but there is a lack of longitudinal information on just when in the life course that becomes apparent. Of course, polypharmacy is most evident in residential aged care, where, for example, a national survey of facilities in NZ found the prevalence of polypharmacy to be 73% (and found that one in five residents were taking 10 or more medications, and no-one was taking none; Ferguson et al, 2020). Antihypertensives, analgesics and antireflux drugs were the most common types of medication taken.

Polypharmacy has become more common in recent decades, reflecting increased prescribing based on multiple clinical practice guidelines, each focusing on a single condition (Le Couteur et al, 2016). In many cases, of course, the number of medications being taken by an individual is entirely appropriate and safe, but polypharmacy is also a known risk factor for drug-related harms, falls, cognitive decline and frailty (Page et al, 2019; Fried et al, 2014; Gutierrez-Valencia et al, 2018). It also increases the risk of drug interactions (Guthrie et al, 2015), medication error (Page et al, 2019), and the chance of important conditions going untreated (Kuijpers et al, 2007). Moreover, some medications taken by may no longer have any therapeutic or preventive effect. Health systems also suffer from the economic impacts of unnecessary prescribing and having to manage the consequent adverse events (Morgan et al, 2016; O'Connor et al, 2016).

Despite medication-associated dry mouth being by far the most common form of the condition (US Surgeon General, 2021), little is known of its natural history, and the proposed work will provide much-needed information on that.

A lack of data from younger adults has led to a lack of awareness of the emergence of polypharmacy and a consequent failure to think longitudinally and consider the life course. Older people do not suddenly appear "fully formed" at age 65 (or whenever people might be considered to be "old"); they have been on a journey through adulthood and middle age, steadily accumulating a burden of non-communicable diseases (NCDs). The proposed work will provide thought-provoking information on ageing into mid-life. Preliminary analyses have been informative, with steady increases in prevalence from ages 26 through 45 for some therapeutic categories (such as antihypertensives, antireflux drugs, hypoglycaemics, statins and nutrient supplements) and a predictable fall in use of oral contraceptives. By age 45, 11.3% of Study members meet the definition for polypharmacy.

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Data Security Agreement

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Today's Date	3/11/21

Please keep one copy for your records and return one to the PI Sponsor

Please initial your agreement: (customize as necessary)

x	I am current on Human Subjects Training [CITI www.citigrogram.org] or equivalent.
x	My project is covered by the Dunedin Study's ethics approval
x	I will treat all data as "restricted" and store in a secure fashion. My computer or laptop is: • encrypted (recommended programs are FileVault2 for Macs, and Bitlocker for Windows machines) • password-protected • configured to lock-out after 15 minutes of inactivity AND • has an antivirus client installed as well as being patched regularly.
x	I will not "sync" the data to a mobile device.
x	In the event that my laptop with data on it is lost, stolen or hacked, I will immediately contact my PI Sponsor or Study Director, Richie Poulton (richie.poulton@otago.ac.nz).
x	I will not share the data with anyone, including my students or other collaborators not specifically listed on this concept paper.
x	I will not post data online or submit the data file to a journal for them to post. *Some journals are now requesting the data file as part of the manuscript submission process. The Dunedin Study Members have not given informed consent for unrestricted open access, so we have a managed-access process. Speak to your PI Sponsor or Richie Poulton for strategies for achieving compliance with data-sharing policies of journals.*
	I will delete all data files from my computer after the project is complete. Collaborators and trainees may not take a data file away from the office. The data remains the property of the Study and cannot be used for further analyses without an approved concept paper for new analyses.