

Hidden Workers in Ageing Australia: Research Protocol of intersectionality-informed mixed-method study

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Abstract

Background: Australians are living longer and are expected to remain in the workforce for longer, yet many older adults struggle to secure employment despite being willing and able to work. A growing share of these individuals are “hidden workers,” those underutilised in the labour market due to missed hours, long-term unemployment, or withdrawal from job seeking despite capacity to work. This group reflects a global trend of ageing yet underused workforces, and in Australia they represent a significant proportion of the working-age population. Addressing the challenges of hidden workers is crucial, as their inclusion could help meet labour market demands, alleviate fiscal pressures of ageing, and promote healthier, more equitable ageing trajectories.

Objective: This intersectional mixed-methods study has three overarching aims: first, to investigate how intersecting social identities (e.g., age, gender, cultural background, health status, and caregiving responsibilities) shape hidden workforce participation and associated health outcomes among older Australians; second, to compare hidden workers with currently employed populations in order to identify health discrepancies between the two groups; and third, to explore the lived experiences of hidden workers, focusing on how intersecting and multiply disadvantaged identities impose additional burdens on employment outcomes and health status. Together, these objectives will generate an integrated understanding of both structural and lived dimensions of hidden work, providing evidence to inform more equitable labour market and health policies.

Methods: This study employs an explanatory sequential mixed-methods design to investigate the health, resources, and employment experiences of older hidden workers in Australia. In Phase 1, an online cross-sectional survey was administered to 1,166 participants (696 hidden workers aged 45+ and 470 current workers), capturing variables on employment history, health, discrimination, workplace social capital, caregiving, and socioeconomic status. Validated instruments, including the Workplace Age Discrimination Scale, Intersectional Anticipated Discrimination Scale, and Workplace Social Capital Index, were incorporated to ensure reliability. Phase 2 will involve semi-structured interviews with a purposive subsample (30 participants) identified from survey results, focusing on lived experiences of workforce exclusion and intersecting barriers. In Phase 3, quantitative and qualitative findings will be integrated through triangulation and complementarity to provide a comprehensive understanding of hidden workers’ challenges and assets, generating evidence to inform policy and stakeholder recommendations.

Results: As of August 2025, the online survey has been completed, and the recruitment for interview participants will start in September. The results from aim 1 will be published in 2026.

Conclusions: This study will generate the first intersectional evidence on the health and employment challenges of older hidden workers in Australia. These insights will inform tailored policy interventions that can support re-engagement, reduce inequities in health and wellbeing, and strengthen workforce participation. Ultimately, the findings will contribute to addressing skills shortages while promoting social and economic inclusion of older Australians.

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Original Manuscript

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Keywords: Employment; Unemployment; Aged; Intersectionality; Health Status Disparities; Mixed Methods

1. Background

Ageing workforce and hidden workers

Australians are living longer and expected to work for longer than ever before. With longer life expectancy and more years of disability-free living, older Australians now have both greater capacity and greater need to remain in the workforce. (AIHW 2024). As a result, many older Australians want to continue to work, many of them are eager to get a job or increase their working hours. Nonetheless, despite decades of experience, older job seekers struggle to get a foot in the door. Maestas and Li (2006) estimated that 13 per cent of older workers become discouraged workers or hidden workers, meaning those not actively seeking employment despite being willing and able to work, often due to repeated rejection or perceived lack of opportunities (Jobs and Skills Australia, 2022). Moreover, many of discouraged workers face age-based stereotyping and discrimination. Older "hidden workers" reflect a global trend of an ageing yet underutilised workforce (ILO, 2024)

Fuller and colleagues (2021) coined the term 'hidden workers' to include three categories of labour underutilisation: "missing hours" (working one or more part-time jobs but willing and able to work full-time); "missing from work" (unemployed for a long time but seeking employment); and "missing from the workforce" (not working and not seeking employment but willing and able to work under the right circumstances). Hidden workers would be an adequate

analytical tool to capture this important, persistent, yet overlooked social problem in Australia, where they comprise 22% (Lee et al., 2024) of the age 15 and over population. Based on a recent meta-narrative review on hidden workers (Lee and Kang, 2024), scholars have devoted significantly less attention to the patterns and drivers for these groups of workers compared to the unemployed.

At the same time, companies are struggling to find people with skills and competencies (ABS, 2025). Sixty-four percent of HR leaders say their companies are struggling with skills shortages, yet only 4 percent of employers have any formal plan to keep older workers in the workforce (Butrica and Stipica, 2022). Hidden workers face several overlapping barriers to employment. Many experience a skill mismatch, where their qualifications no longer align with current job demands, often due to industry change or outdated training. Technology gaps exclude those without digital skills or reliable internet from applying for or securing jobs, especially in rural areas or among older workers. Employer biases, such as ageism, gender discrimination, or prejudice against people with health conditions or from diverse backgrounds, further limit opportunities. In addition, inflexible work arrangements — rigid schedules, mandatory on-site presence, and lack of accommodations — make it impossible for those with caring responsibilities, health constraints, or transport difficulties to participate fully in the labour market (Fuller et al., 2021). Many organisations have already realized that the retention of older workers will be necessary to face the skills shortage. Enabling older workers to work more if they wish to, provides an additional option to counter these challenges arising from demographic change (Salzmann et al. 2023). This is particularly important because the engagement in work-related activities after retirement was found to be related to better mental and physical well-being of individuals (Kim & Feldman, 2000; Wang, 2007; Zhan, Wang, Liu, & Shultz, 2009).

Therefore, better understanding and addressing the hidden workers among older populations is important because they represent an underutilized economic resource that can offset the fiscal pressures of population aging (Maestas & Li, 2006). At the same time, they are systemically excluded group with notable implications to inequitable health and wellbeing trajectories associated with labour market discrimination (Paul and Moser 2009).

Ageing hidden workers and health

Research shows that both unemployment and underemployment harm mental and physical health. Unemployment can leave lasting “scars” on individuals’ careers—including reduced wages, diminished job quality, lower aspirations, and fewer long-term achievements—even decades after the initial job loss (Borland, 2020). Underemployment also affects psychological well-being, with people

reporting poorer mental health and reduced life satisfaction, which can in turn impact overall health outcomes. (Nostrom et al. 2019; Fernandez et al., 2020 Bravo & Herce, 2022). Factors such as learned helplessness, discrimination, and socioeconomic disadvantage can contribute to the development of health inequalities among hidden workers (Heslin et al., 2012). In Australia, older jobseekers often spend much longer out of work than younger people, and this prolonged unemployment can be especially damaging. Extended time without a job can erode financial security, increase social isolation, and harm both mental and physical health. For many older Australians, this also undermines life satisfaction and overall quality of life, making it harder to re-enter the workforce and harder to age well. Given Australia's ageing population and the need to keep more people in work for longer, addressing these barriers for older hidden workers is not only a fairness issue but also essential for sustaining the economy and reducing future health system pressures. (Bowman et al., 2016). In the Australian context, addressing these adverse outcomes requires a systems approach that transcends individual-level job search interventions. Coordinated strategies across employment services, healthcare provision, housing policy, and social protection frameworks are essential to mitigate the multifaceted barriers that sustain labour market detachment.

Older hidden workers face unique challenges as they age. Age discrimination remains a significant barrier for older-aged jobseekers in Australia, leading many to leave the workforce prematurely McGann et al. (2016). Research highlights that ageing intersects with other types of inequality such as race, gender, and class creating individualised career capital paths (Dugger, 1999; Spedale et al., 2014; Tempest et al. 2016).

Older workers face barriers organisational levels. Some may unintentionally reinforce negative stereotypes through their behaviour, while organisations often hold biases that older workers are costly, less adaptable, less energetic, or resistant to change and technology. Industry cultures that favour youth, younger managers' discomfort in engaging with older staff, workplace isolation, and organisational structures that unintentionally enable age discrimination all contribute to exclusion. Recruitment processes also disadvantage older workers, as HR managers perceive higher risks in hiring them and prefer candidates with longer potential tenure. Additionally, older jobseekers who have been out of the job market for long periods may struggle with outdated recruitment knowledge and interview skills (AHRC 2016; AHRC 2023; Butrica and Stipica, 2022). Health inequalities that are already projected on the hidden workers can be further exacerbated by the ageing effect and labour market discriminatory practices.

Within these studies, there is very little recognition of the way the challenges related to ageing, due to having a set of identities (e.g., gender and age) might

intersect with or be compounded by the challenges of employment. This discrimination can contribute to health disparities and negatively affect the well-being of older individuals, underscoring the need to address ageism in the labour market to promote health equity and life satisfaction among older hidden workers (Baum and Mitchell, 2009; Rudman 2017).

Thus, comprehending this overlooked population group in an ageing context is crucial. Addressing these challenges through targeted interventions and policies is essential to mitigate health inequities and improve the overall quality of life for older hidden workers. It is critical to provide evidence-based solutions to support ageing workforce to alleviate scarring health impact and restore opportunity structure much needed from this group of older population.

Intersectional lens to investigate health inequalities of older hidden workers

Intersectionality acknowledges how a person's social identities may interact to lead to increased experiences of discrimination or disadvantage. This means that older hidden workers may experience multiple forms of marginalization and the status being hidden can also be simultaneously impacted by multiple, interlocking oppressive systems. Thus, older hidden workers are not a homogeneous group (Fuller et al., 2021; Shields et al. 2024) but with different attributes, needs, and outcomes. The appropriate supports required to reduce inequalities will vary across the population. ABS has recently published potential workers statistics that there are 1.7 million "potential workers are willing to work but can't (ABS, 2025). While informative, the older jobseekers, carers, or people with health issues—may no longer say they want a job due to discouragement, but they remain part of the hidden workforce. Addressing this evidence gap is critical for designing equitable, targeted policy interventions.

Therefore, this project will be mixed method research, using Australian survey data from both older hidden workers and currently employed older adults and interviews focused on hidden workers, to examine how intersectional identities shape workforce participation and associated health outcomes. By comparing these groups, the study will identify how overlapping social disadvantages influence both employment barriers and mental and physical well-being. This study can identify differences in individual-level barriers, health status, and enabling factors and we will be able to discern the differences in barriers and facilitators toward the working patterns in their later lives. This would allow the researcher to identify composition of groups with single and multiple social disadvantages.

Qualitative interview will be used to triangulate and complement the quantitative findings with the lived experiences of older hidden workers with diverse conditions and circumstances. The hidden workers with various

conditions and circumstances may include caregivers, bereaved, veterans, immigrants and refugees, those with physical disabilities, and relocating partners and spouses. They also include people with mental health or developmental/neurodiversity challenges, those from less-advantaged populations, people who were previously incarcerated, and those without traditional qualifications. More detailed information on the sampling strategy and design will be provided in the methods section.

2. Aims and Research Questions

This intersectional mixed-methods study addresses three overarching research aims and a number of more specific research objective: To investigate how intersecting social identities influence hidden workforce participation and associated health outcomes among older Australians, using an intersectional mixed-methods approach.

- Compare hidden workers and currently working populations to identify health discrepancies between the two groups.
- Understand the lived experience hidden workers and how their intersecting identities, and multiply disadvantageous identities impose any additional burden on their employment outcome and health status.

3. Theoretical framework: The Intersectionality-based Hidden workers Health Inequality Framework (IHHIF)

The Intersectionality-based Hidden workers Health Inequality Framework (IHHIF) (see Figure 1) arises from the public health perspective. IHHIF begins with an intersectionality lens and builds upon the World Health Organization's "Conceptual Framework for Action on the Social Determinants of Health" (CSDH 2008) and brings together the concepts from social cognitive career theory to disentangle the complex relationships between employment and health inequalities experienced by hidden workers. This integration offers a novel approach by linking structural determinants, intersecting identities, and career-related cognitive processes within one framework. First the key theoretical underpinnings will be explained, highlighting rationales for the respective IHHIF components that are added from the theories and frameworks.

Figure 1. Intersectionality-based Hidden workers Health Inequity Framework (IHHIF, author's own)

This framework integrates intersectionality theory and social cognitive career theory (SCCT) to conceptualize how structural and individual-level factors shape the health and employment

outcomes of older hidden workers.

Intersectionality: Identities:

To understand the reality of multiply marginalised hidden workers effectively, this research is guided by a theory that highlights intersecting identities and systems of oppression, recognising how overlapping social positions shape both employment and health outcomes. The study design also incorporates methodological flexibility, combining quantitative and qualitative approaches to capture how structural-level factors/determinants intersect with individual-level (e.g. self-reported discrimination) and community-level variables relevant to hidden workers.

Since Crenshaw (1989) first introduced the concept of intersectionality to capture limitations of antidiscrimination laws that failed to protect Black women who “experience discrimination as a Black woman – not the sum of race or sex discrimination, but as Black women “(p. 149). Intersectionality is a lens that enables us to investigate interlocking systems of oppression. Scholars have elucidated the value of combining both quantitative and qualitative methods in order to more effectively explore the systems of oppression and privilege, ultimately contributing to practical strategies for advancing equity among multiply marginalised individuals (Grzanka, 2018; Lewis et al., 2018). Embedding intersectionality in the IHHIF helps deepen understanding and provides evidence to guide inclusive employment and health policies that tackle the combined disadvantages hidden workers face.

Social cognitive career theory (SCCT): Experience, Expectations, Intentions, Attitudes, Actions

Social cognitive career theory (SCCT) provides a valuable framework for understanding the career development process of older jobseekers. SCCT, rooted in Bandura's social cognitive theory (1986), and builds upon Lent et al. (1994), offers a robust framework for examining the career trajectories of older hidden workers. It identified three social cognitive mechanisms to be especially important to career development: self-efficacy beliefs, outcome expectations, and goal Settings. For older hidden workers, SCCT can offer insights into how cognitive processes, personal beliefs, and environmental factors influence their career interests, choices, and behaviours and help identify strategies to enhance older hidden workers' self-efficacy, address age discrimination, and promote positive career outcomes.

Experience: In the context of older hidden workers, the experience of discrimination—either directly or indirectly via observing trends or consuming media headlines (Haynes, 2009; 2015) may undermine the job search activities.

P Negative culture and social norms may result in subtle social isolation (a form of “new ageism”) and eventual eviction of older workers (Lu 2011; Duncan, 2003), further influencing how individuals appraise their career opportunities.

Expectations: Outcome expectations represent another important component of SCCT. Outcome expectations are personal beliefs about the probable outcome of a behaviour. They involve the imagined consequences of performing a certain behaviour. Thus, outcome expectations play a major role in motivating certain behaviours. These expectations can be viewed on many levels including physical, social, and self-evaluative, and they include several types of beliefs about those outcomes, such as beliefs about extrinsic reinforcement, self-directed consequences, and outcomes derived from the process of performing a given behaviour. In this research, outcome expectations are reflected in participants’ perceived probability of employment, which may influence persistence and intensity in job search.

Attitudes: We need to take attitudinal factors into consideration, especially those related to aging held by older adults themselves. Western research has noted that perceived social identity as an “older worker” was related to negative attitudes towards work (stronger desire to retire early) (Desmette and Gaillard, 2008). Being categorized as “older workers” makes individuals potential targets for prejudice and discrimination related to aging (2003; Johnson, 2009; Huang, 2007). In this project, the attitudes of hidden workers are indicated by the passivity of one’s job search behaviour and the tendency to withdraw from the labour market.

Intentions: According to SCCT, intentions evolving from self-efficacy, outcome expectations, and interests bundle motivation that drives subsequent actions (Ajzen, 1991; Lent et al., 1994). Whether or not one intends to work or work more hours is the critical decision point that is influenced by previous experience, attitudes, and expectations.

Actions: In this study, the frequency and breadth of job search undertaken by the hidden workers are chosen as a main outcome variable where the actions undertaken to engage in learning or adapting climate-impact reducing strategies at work collected as secondary variables.

In sum, SCCT suggests that there is a complex interplay among self-efficacy, outcome expectations, and goal setting. The interplay among the three major components of SCCT (self-efficacy, outcome expectations, and goal setting) do not occur inside a vacuum, nor do they function alone in shaping interests and various vocational outcomes. Social cognitive and contextual factors are hypothesized to directly influence the development of career interests, plans,

and actions. Lent et al. (1994, 1996) argued that the particular effect that contextual factors have on individuals' career choices often depends on their personal appraisal of and response to such factors—an approach that aligns closely with the realities faced by older hidden workers.

Social determinants of health (CSDH): Health Inequalities, Conditions, Assets, External contexts

In practice, the impact of ageing on individuals and their careers is complex and diverse (Bal et al., 2015). CSDH takes a life course perspective in recognizing how social, economic and political context influence health outcomes. It represents concepts that are shared within health equity literature: governance, policy, education, occupation, income, gender, ethnicity and race, behavioural, psychosocial and biological factors. CSDH also offers considerations that may be less recognized within employment, particularly societal and cultural norms and values and material circumstances. CSDH focuses on the distribution of health and well-being and emphasizes how the various social structures can generate different outcomes between populations, suggesting the necessity of applying a health equity lens from policy through to practice. CSDH represent direction and magnitude of the mechanisms that influence the distribution of health and well-being. CSDH incorporates feedback loops, suggesting that the framework is not to be interpreted as a linear model, but as a web of relations.

Assets: Assets in communities, individual and workplace social capital are important indicators of community assets that can help foster hidden workers' employability. Access to learning would further facilitate one's opportunities and pathways for employment.

External contexts: The external contexts can be broad ecological macroeconomic conditions such as COVID19 or recession. It could also be the welfare policy reform or retirement policy change. Area-level, industry -level or firm-level actions for their current and future employees can also constitute external contexts.

4. Methods

4.1 Ethics Approval

The study has an ethics approval from La Trobe University (HEC 23459).

4.2 Research Design

This is a cross-sectional mixed methods approach to develop a rich understanding of study participants' mental and physical health, coping

strategies, access to resources, and informal and formal support for employment access. We will explore relevant assets and strengths for hidden workers and examine variations through the lens of intersectionality. Analyses, outputs, and dissemination plans will be planned to inform new findings to key stakeholders.

The study is an explanatory sequential mixed methods design in which a quantitative element is used first and followed by a qualitative component contingent on and informed by the initial quantitative results. Preliminary findings from the quantitative analysis will inform later phases of qualitative data collection and hypotheses derived from qualitative analysis will be tested in the quantitative component. A value of this design is that it enables researchers to further explore the nuances and mechanisms that explain the quantitative results (Plano Clark, 2019). The project will have three phases of gathering different resources. Figure 1 provides an overview of the steps taken in the data collection and analysis.

Figure 2. Mixed method research design

The explanatory sequential mixed-methods design integrates quantitative survey data with qualitative interviews to provide a comprehensive understanding of older hidden workers' employment and health experiences.

Phase 1: Online Survey

The first phase will comprise an online cross-sectional survey administered to both hidden and non-hidden workers using the QuestionPro platform from Dec 2024 to March 2025. This platform provided access to a large, diverse participant pool across all Australian states and territories, enabling recruitment that captures variation in demographic, socioeconomic, and employment characteristics (QuestionPro, n.d.). The survey is designed to ensure representativeness where possible and to capture key variables relevant to employment status, work history, health, and caregiving responsibilities.

The questions will be used to 1) examine the circumstances and lived experiences for hidden workers, particularly those facing multiple and intersectional forms of marginalisation (e.g., cultural and linguistic diversity, disability, older age?), 2) discern the differences of attitudes, behaviour, and health status between hidden and non-hidden workers, with a focus on their perspectives, challenges, and opportunities related to labour market participation.

Table 1. Data variables table

	Hidden workers	Current workers
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ACTIONS		
Job search undertaken	X	X
Engaged in learning	X	X
Adapted climate impact mitigation strategies	X	X
INTENTIONS		
Willing to work	X	
ATTITUDES		
Degree of discouragement	X	
Passive/active job seekers	X	
Attitudes to learning	X	X
WORK HISTORY		
Work history	X	X
Workplace discrimination	X	X
Workplace social capital	X	X
HEALTH AND WELLBEING		
Long term health conditions	X	X
Subjective health status	X	X
Mental health wellbeing	X	X
Quality of life indicators	X	X
Everyday discrimination index	X	X
CONDITIONS		
At risk living conditions	X	X
Childcare needs	X	X
Other caregiving needs	X	X
Household living arrangement	X	X
Household income	X	X
EXTERNAL CONTEXTS		
Impact of COVID19	X	X
Housing crisis	X	X
Supportive workplace policies	X	
ASSETS		
Social capital (support networks)	X	X
Access to learning	X	X
Community assets	X	X

The total sample for the survey is 1166, where 696 is selected as hidden workers aged 45+ years and 470 who are currently in the workforce. A total sample of 1166 affords $\sim\pm 4.4\%$ precision for group proportions, detects 6–7 pp differences in prevalence at 80% power, supports multivariable regression with adequate EPV, and provides sufficient stability for LCA-based subgroup identification and subsequent policy targeting—meeting both statistical power and policy-interpretability needs.

The decision to have 45 as our age cutoff is based on the Australian context. While there exist discrepancies between definitions of ‘mature aged’ across different countries and various organisations, the Department of Employment and Workplace Relations (DEWR) defines ‘mature age’ to include persons over 45 years (DEWR 2023). This will be first attempt to utilise the survey to ask two groups (currently working and hidden workers) enabling us to discern, for the first time, the differences in work expectations and perceptions toward their later working lives. This would allow the researcher to identify composition of groups with single and multiple social disadvantages, which in turn would inform the population groups for the in-depth interview (phase 2). These questions are multiple-choice, simple answer, and scale questions. The survey is anonymous, and participants can leave the survey anytime. It is expected to take approximately 15–20 minutes to complete.

Various measures of discrimination index will be collected. The 45 and over are exposed to accumulated life-long discrimination and inequality. Until recently, few studies had explicitly investigated discrimination based on multiple social identities or positions (Bastos et al., 2010; Lewis et al., 2015). Recent development on tools to identify intersectional discrimination, Intersectional anticipated discrimination scale (InDI-A) (Scheim and Bauer, 2019) is a useful tool to understand the exposure to discrimination of hidden workers over 45. We have integrated the questions to the survey together with the validated Workplace Age Discrimination Scale (WADS) (Marchiondo et al. 2015). These instruments were selected for their ability to capture multidimensional and intersectional experiences of discrimination, and will be complemented by demographic variables (e.g., gender, ethnicity, country of birth, education, employment history, income, household structure) to allow analysis of intersectional effects.

Workplace Social Capital (WSC) is defined as a workplace resource that concerns employees’ perceptions regarding trust, reciprocity (cognitive WSC), and network interactions (structural WSC) that exist both among peers (bonding WSC) and among individuals across different hierarchical levels or organizations (bridging WSC) (Harpham et al., 2002; Narayan & Cassidy, 2001; Szreter & Woolcock, 2004). Workplace social capital is an important indicator to

understand the relationship between relational aspects and individual's attitudes to entering/re-entering workforce. The validated Workplace Social Capital index (WSCi) will be used in this survey (Tsounis et al., 2023). Together, these validated measures and contextual variables provide a robust methodological framework for multivariate and intersectional analyses. Furthermore, all instruments have demonstrated strong psychometric properties in older worker populations, with internal consistency (Cronbach's α) typically exceeding 0.80, ensuring reliability for this study cohort (Gonzalez et al., 2015).

Phase 2: Interview

Based on the quantitative findings from Phase 1, a purposive subsample of approximately 30 participants will be invited to take part in in-depth qualitative interviews (September 2024-October 2024?). From Facebook ads, we will be recruiting participants to approximately reflect the characteristics of the older populations facing multiple and intersecting barriers to enter or re-enter workforce. The semi-structured interview guide will be developed and piloted with 1-2 participants to refine questions. Semi-structured interviews will be conducted via zoom. The zoom recordings will be stored on cloud but will be transferred to the secure storage and protected for privacy. The data will be retained for 5 years and only the lead researcher will have access to the raw data. Each will take approximately 60 minutes and asked about work and family biographies, their experience in labour market, barriers in entering job market and health. Transcripts will be de-identified by removing names and potentially identifiable information before being analysed thematically using NVivo qualitative software (QSR International Pty Ltd., 2020), following Braun and Clarke's (2006) six-phase framework for thematic analysis.

4.3 Data analysis and Dissemination

Survey Analysis

A descriptive statistical summary will be provided. More in-depth analysis will be conducted using Stata 18 (StataCorp, 2023), incorporating all variables in the dataset to address the research questions:

1. How do outcomes, including resource access, quality of life, physical and mental health, and social networks, and their trajectories differ between older hidden workers and older non-hidden workers, across subgroups defined by minoritised status, condition/impairment, and citizenship status, as well as intersectional combinations of these characteristics?
2. To what extent are differences in outcomes and trajectories between older hidden and non-hidden workers associated with healthy ageing indicators?
3. What individual, structural, and contextual factors contribute most to between- and within-group disparities in outcomes and trajectories

among older workers?

Data analysis will be conducted in three stages, aligned with the research questions. For RQ1, descriptive statistics will compare key outcomes between older hidden and non-hidden workers, followed by multiple regression models incorporating interaction terms (e.g. group $\times$ minoritised status, condition/impairment, citizenship) to assess intersectional effects. For RQ2, healthy ageing indicators will be added to the models to examine their explanatory role in observed group differences. For RQ3, we will apply inequality decomposition techniques (e.g. Blinder-Oaxaca) and variable importance ranking to quantify the contribution of individual, structural, and contextual factors to between- and within-group disparities. .

We will require completion of almost every question on every page for participants to proceed so that we can undertake the association analyses required. This means that there should generally be no missing items in any measures. However, this requirement may lead to completion attrition, with respondents giving up and logging off. We will try to mitigate this possibility in the design, which will allow participants to save responses and return to the survey later, and the survey will be developed and piloted with 30 people.

Any residual missing data will be documented. Analyses will use pairwise deletion where appropriate to maximise data retention for each analysis. If patterns suggest that data are not missing at random (MNAR), appropriate imputation methods will be employed to minimise bias. Sensitivity analyses will be conducted to compare results from complete-case, pairwise deletion, and imputed datasets to assess robustness.

Interviews

The qualitative phase will be informed by the survey results from Phase 1, in line with the explanatory sequential mixed-methods design. We anticipate conducting approximately 25–35 semi-structured interviews, with the final number determined by the need to ensure representation of key intersectional subgroups identified in the quantitative analysis (e.g., combinations of minoritised status, condition/impairment, and citizenship status) and to reach thematic saturation.

We will recruit interview participants from advertisements/links distributed through a range of platforms and networks, as well as through local lay coresearchers. We will rely on participant self-identification of citizenship status and condition/impairment. Posters, advertisements, and snowball sampling will target those who lack resources or technology to be recruited via online messages; they can contact us by telephone or email.

Respondents can choose to have their interviews by remote video methods, lasting approximately 60-90 minutes, telephone, or in-person (where feasible) to accommodate varying access needs. Interviews will be recorded and professionally transcribed. Attention will be given to making the interviews fully accessible and inclusive, and all researchers will be vigilant to the participant needs such as requiring frequent breaks. All potential participants will be informed about the study in plain English (read to them if needed) and told that interviews will be in English by default. Translated and accessible study documents will be provided if required to ensure that participants are able to give fully informed consent. The interview guide will be informed by the survey results (Phase 1) and will cover the same key domains (Table 1), with flexibility to explore emergent themes.

Prior to data collection, the interview guide will be pilot tested with 2-3 participants representative of the target population to ensure clarity, cultural appropriateness, and relevance. Feedback from the pilot will be used to refine question wording, sequence, and prompts. This approach will provide the qualitative phase effectively expands upon and contextualises the statistical patterns identified in the quantitative analysis.

The in-depth interview would further inquire how the multiple barriers are impacting hidden worker seen from the lived experiences of workers. The data gathering will be designed to examine the intersecting relationships between various determinants to workforce participation and life circumstances such as care responsibilities; cultural background; socio-educational background and gender. While these dimensions have been reported as having significant relationships with workforce participation in quantitative literature, little qualitative work has investigated them.

Analysis

Initially individual narratives will be explored by considering how each participant describes and explains how their experiences of health and employment interacted at various points in their working life. This initial analysis will also examine how the wider contexts of the participants' lives (e.g. family and social connections, and the wider macro-level context) may influence these transitions. This analysis will utilise intersectionality theory.

Phase 3: Integration of Quantitative and Qualitative Findings

As shown in Figure 2, this phase will integrate outputs from Phase 1 (survey) and Phase 2 (interviews) to provide a comprehensive synthesis.

Triangulation is defined as an act of seeking convergence of results of the same research question from different methods, to increase the validity of results. A

main advantage of triangulation is its attempts to validate, or enhance the accuracy of, research findings by comparing different sorts of data on the same topic. with qualitative findings substantiating quantitative findings. Moreover, if convergence is not achieved, quantitative and qualitative data can be put into dialogue with each other through the use of participant review groups who can offer improved interpretations on both sets of findings (Fielding, 2012).

Complementarity, in contrast, allows scholars to elaborate and enhance results from one method with results from another method, with attention to multiple facets of the same question. For instance, combining qualitative data with quantitative results contextualizes hidden female workers' experiences by highlighting how labour market practices create a caustic environment for them to kept hidden. A complementarity intersectional mixed methods research approach is useful for research on multiply marginalized hidden workers specifically because it employs an intersectional framework to both identify patterns relevant to hidden workers and explain why these patterns may exist in a single study.

Implementing these strategies within a single study could provide a comprehensive understanding of the desired needs and services for this client group, while also providing clear direction to the centre for addressing gaps. To date, the scholarship on intersectionality theory and the literature on mixed methods research have largely developed in silos, with limited interdisciplinary conversation about the benefits of their integration. Intersectionality scholars have elucidated some advantages of combining statistical approaches with in-depth narratives (Bowleg & Bauer, 2016; Hankivsky & Grace, 2015; Hankivsky, 2011); yet, in practice, few studies have fully realized what is possible in intersectional mixed methods research, especially regarding tackling complex questions concerning multiply marginalized hidden workers.

Integration will be conducted collaboratively by both qualitative and quantitative researchers to ensure balanced interpretation. The final outcome of this phase will be a synthesis report, policy recommendations, and community briefs co-developed with the Project Advisory Group (PAG) and stakeholders. Thus, this study aimed to highlight how intersectional mixed methods research could be used for several purposes to advance research on Hidden workers.

4.4 Disseminations

Communications will be achieved through the participants' preferred method of communication. We will tailor to our key audiences, that emphasize practical solutions and implementation. The dissemination plan will be determined with our PAG and through our cocreation meetings, with an indicative timeline to ensure early, interim, and final updates are shared in sequence. Findings will be

disseminated through peer-reviewed publications, national and international conferences.

Overall synthesis will provide an executive overview for easy assimilation by policymakers and practitioners. This will indicate where changes to health/social care policy and practice are likely to be most effective, with targeted briefings and roundtable discussions to maximise uptake. An overview of findings and ideas for outputs will be presented to participating communities more widely via collaborator platforms, to give them the opportunity to reflect upon and interrogate researchers' interpretations and analysis of the data, and their feedback will be incorporated where appropriate.

Findings and ideas for outputs will also be distributed through trusted community channels such as places of worship, trusted religious leaders, community champions. This will enable broader community input into the final project outputs. All findings will be publicly available via our website in accessible forms for lay consumption. Confidentiality will be maintained throughout, with any potentially identifying information removed before dissemination.

5. Discussion

5.1 Anticipated findings and potential impact

In undertaking this study, we will fill a gap in the evidence about the hidden workers in ageing Australia. We expect to contribute considerable new knowledge through our mixed methods approach, aligned with national priorities on workforce participation and skills, including current Australian workforce and ageing strategies (ALRC, 2019). Drawing on the survey data, we will quantify issues such as those relating to access to labour market resources, social networks of support, and discrimination and marginalisation. However, we are particularly interested in the strengths and assets that have improved our participants' capacity to cope with their unemployment/underemployment, to identify scalable supports and pathways that can be piloted and, if effective, implemented nationally with employer and community partners.

We believe this is important, as many health and well-being challenges, such as those faced by minority ethnic groups at the intersection with chronic conditions/impairments and insecure citizenship status, can be mitigated by adjustments to health and social care service, policy and delivery, formal networks such as community health services, and informal networks such as family and friends. We expect to provide recommendations for these adjustments and for potential interventions through this mixed methods

analyses, translated into policy briefs, practitioner guidance, and community toolkits that can support rapid adoption by government, providers, and employers. We may also design some simple interventions ourselves, including low-cost, co-designed pilots targeting identified barriers such as digital skills gaps, flexible work design, or navigation support. To attempt to tease out the impact of the ageing hidden workers, we will: (1) model relationships between mediating variables (including social network features) and health and social outcomes (and consider indicative economic and workforce implications of reduced early exit and improved re-entry); and (2) explore participant current and recent experiences, and labour market access.

It is anticipated that the research will provide new information on the interventions, support and individual factors which assist the older hidden workers, with relevance to other ageing economies facing similar hidden workforce challenges. The academic research will not only help inform how Australian government can improve its interventions but will also provide new information on how to prevent people having to leave work and extend working lives. This research will inform current and future welfare-to-work and job retention initiatives and improve their effectiveness in helping older people extend their healthy working lives.

5.2 Building on Prior Research

Several recent foundational studies (Lee & Kang, 2024a; Lee & Kang, 2024b; Lee et al., 2025), including both a comprehensive review article and econometric analyses using the HILDA dataset, provide important context for this project. These works establish the empirical and theoretical groundwork upon which our study builds, enabling us to situate our findings within the broader Australian labour market literature.

5.3 Strengths and Limitations

We will provide rich quantitative and qualitative data, with an adequate size for qualitative interviews, providing in-depth information through quota sampling. Our research approach will be key to cocreating our outputs with relevant stakeholders. This will include members of the populations we hope will benefit, hidden workers, industry, communities and the government. This will ensure outputs that have real credibility, real-world relevance and value, can be implemented, and are sustainable.

The survey, being primarily digital, will exclude people with poor access to the digital world, although we do offer alternatives such as paper-based copies. Although the ideal study design would have longitudinal survey, we cannot undertake the repeated surveys due to various limitations. However, rigorous synthesis of the multiple types of data we produce and a reflexive approach to

biases should help to contextualize findings within these limitations.

6. Conclusions

Current understandings on hidden workers in ageing workforce are limited with regard to the intersections of various minoritized population subgroups. Inequities existing may have worsened, and public and policy awareness of this exacerbation provides an opportunity for change. This study, using an intersectional assets-based approach and drawing on participatory and mixed methods, aims to fill a gap in the evidence to help inform changes that reduce health inequities of hidden workers in an ageing context.

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Conflicts of Interest

No external financial support or grants were received from any public, commercial, or not-for-profit entities for the research, authorship, or publication of this article.

Data Availability

This article describes a research protocol. No datasets are currently available.

Authors' Contributions

SL conceived the study idea, overall methodology, conceptualizations, and the initial study design, and wrote the first draft of the manuscript. She leads on the study overall. WK contributed to the design of the quantitative methods, LY and MB has provided feedback on the manuscript. All authors read, edited, and approved the final manuscript.

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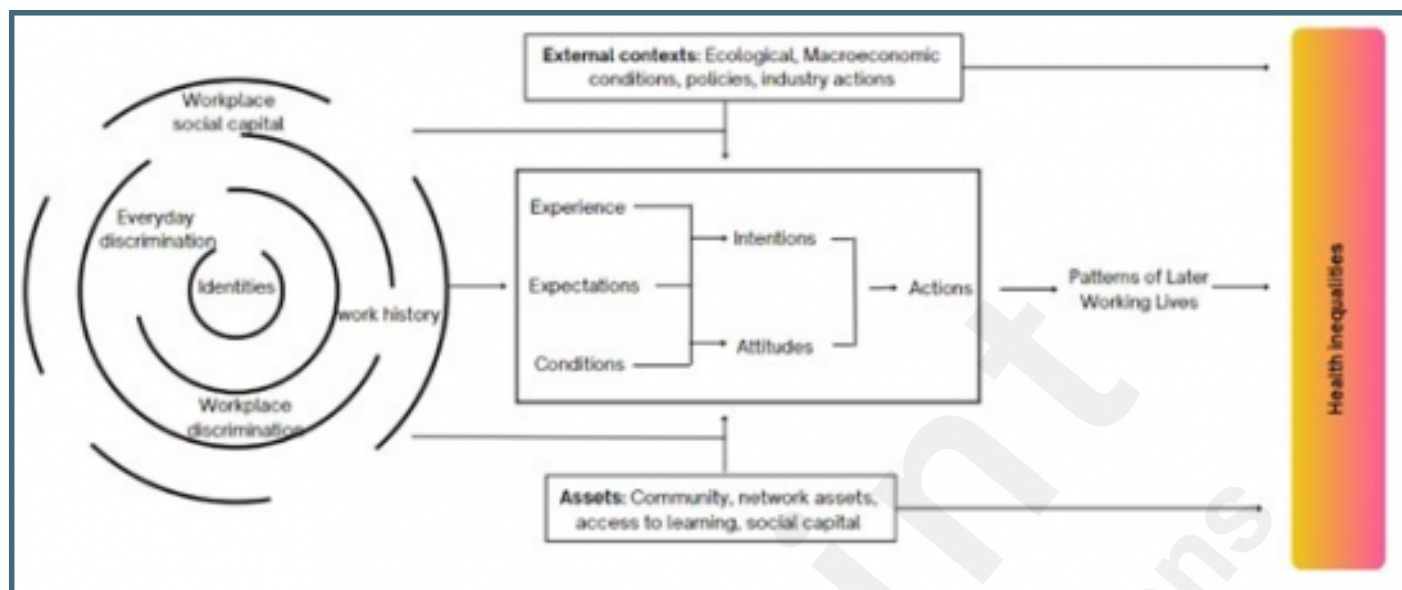
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Supplementary Files

Figures

Intersectionality-based Hidden workers Health Inequity Framework (IHHIF, author's own).



Mixed method research design.

