

# Ageing and older people who use illicit opioids, cocaine or methamphetamine: a scoping review and literature map

Camille Zolopa<sup>1</sup> | Stine B Høj<sup>1</sup> | Nanor Minoyan<sup>1,2</sup> | Julie Bruneau<sup>1,3</sup>  | Iuliia Makarenko<sup>1,4</sup> | Sarah Larney<sup>1,3</sup> 

<sup>1</sup>Centre de Recherche du Centre Hospitalier de l'Université de Montréal (CR-CHUM), Montréal, Québec, Canada

<sup>2</sup>Department of Social and Preventative Medicine, School of Public Health, Université de Montréal, Montreal, Québec, Canada

<sup>3</sup>Department of Family Medicine and Emergency Medicine, Université de Montréal, Montreal, Québec, Canada

<sup>4</sup>Department of Family Medicine, McGill University, Montreal, Québec, Canada

## Correspondence

Dr Sarah Larney PhD, 900 rue Saint-Denis, porte R14-406, Montréal, Québec H2X 0A9, Canada.

Email: [sarah.larney@umontreal.ca](mailto:sarah.larney@umontreal.ca)

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## Abstract

**Aims:** To provide an overview of research literature on ageing and older people who use illicit opioids and stimulants by documenting the conceptual frameworks used and content areas that have been investigated.

**Methods:** We conducted a scoping review of literature relating to ageing and older people who use illicit stimulants and opioids, defining 'older' as 40 years and above. Primary studies, secondary studies and editorials were included. Searches were conducted in PubMed and Embase in July 2020 and March 2021; the Cochrane library was searched in November 2021. Charted data included methodological details, any conceptual frameworks explicitly applied by authors and the content areas that were the focus of the publication. We developed a hierarchy of content areas and mapped this to provide a visual guide to the research area.

**Results:** Of the 164 publications included in this review, only 16 explicitly applied a conceptual framework. Seven core content areas were identified, with most publications contributing to multiple content areas: acknowledgement of drug use among older people ( $n = 64$ ), health status ( $n = 129$ ), health services ( $n = 109$ ), drug use practices and patterns ( $n = 84$ ), social environments ( $n = 74$ ), the criminal legal system ( $n = 28$ ) and quality of life ( $n = 15$ ).

**Conclusions:** The literature regarding older people who use illicit drugs remains under-theorized. Conceptual frameworks are rarely applied and few have been purposely adapted to this population. Health status and health services access and use are among the most frequently researched topics in this area.

## KEYWORDS

Ageing, illicit drug use, older adults, older people who use drugs, opioids, people who use drugs, stimulants

## INTRODUCTION

In many high-income countries, the population of people who use illicit drugs is ageing [1–3]. Older people who use drugs (PWUD), including non-medical opioids, cocaine and methamphetamine, are

increasingly prevalent both in community samples [4,5] and drug treatment services [6–8]. A combination of socio-demographic trends and health interventions have contributed to this phenomenon. Individuals in the 1945–65 and subsequent birth cohorts initiated illicit drug use, including injecting drug use, at higher rates than

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previous generations [9–12]. For some members of this group, drug use remains a persistent behaviour throughout the life-course, including into older age [13,14]. Harm reduction programmes, first widely introduced in the 1980s, helped to reduce premature mortality of PWUD through prevention of infectious diseases and overdose [15]. Antiretroviral therapies to control HIV and, in recent years, curative therapies for hepatitis C infection have decreased HIV- and liver-related deaths among older PWUD, further allowing for an ageing of the population [16,17].

An increasing prevalence of older PWUD has significant implications for harm reduction and drug treatment services as well as primary and geriatric health-care settings [18]. There is increasing recognition that drug use accelerates age-related pathophysiological processes, including inflammation, cellular ageing and declines in brain volume and cognitive functioning [19–21]. Thus, the population of older PWUD is likely to experience greater age-related declines in functioning than their peers of similar chronological age, potentially requiring more intensive intervention from health-care and harm reduction services.

Considering the high prevalence of mental disorders among PWUD, many older PWUD will present with complex patterns of chronic substance use, mental disorders and changes in cognitive functioning that may include dementia [22,23]. Fall risk may be exacerbated by the acute effects of drugs [24]. Prescribed medicines may have unpredictable interactions with illicit drugs of varying composition and concentration [25,26]. Furthermore, well-recognized psychosocial challenges of ageing, such as social isolation, may be exacerbated in older adults who use drugs given frequent disconnection from family, high premature mortality within social networks and stigmatization of drug use that leads to exclusion from mainstream social settings catering to older adults [27–30].

Research on older PWUD is carried out across several disciplines. There is a need to draw this knowledge together to build a coherent picture of the body of research and identify knowledge gaps. This scoping review therefore focused upon two research questions:

1. What conceptual frameworks or theories have been applied in studying older people who use drugs, or ageing and drug use?
2. What content areas or themes have been studied in relation to older people who use drugs, or ageing and drug use?

We use the findings of this review to highlight knowledge gaps and delineate research priorities for the field.

## METHODS

This scoping review used methods outlined by Peters *et al.* [31], while also drawing on Levac *et al.* [32] to guide the process of data charting and synthesis. Scoping reviews aim to summarize potentially heterogeneous research within a field, identifying knowledge gaps and making recommendations for future work [31]. The review protocol is registered on Open Science Framework. Reporting is in accordance with the PRISMA extension for Scoping Reviews (PRISMA-ScR) [33].

## Eligibility criteria

Our focus was on adults who use illicit drugs, and have often done so for a large portion of their lives. We defined ‘people who use drugs’ to include people who inject drugs or use any of heroin, extra-medical pharmaceutical opioids, cocaine (including crack cocaine) or methamphetamine. These drugs were selected as regular use is associated with substance use disorder or dependence and the potential for significant health and social harms. Older adults may be prescribed benzodiazepines and other sedatives later in life, and may progress to problematic use of these substances, but we did not consider these adults to be exemplifying the same phenomenon as people who have used illicit drugs for much of their adult lives. Therefore, studies of only benzodiazepine and sedative use were excluded, but studies that included these substances together with our drugs of interest were included. Additionally, we excluded studies of only cannabis, alcohol or psychedelic use, as this was not aligned with our focus on illicit drugs that are linked with significant harms. However, PWUD in included publications often reported polysubstance use, including substances that were not the focus of this review. There was no restriction regarding drug use status; studies of people actively using drugs and people who previously used drugs were included.

‘Older’ adults were defined as those aged 40 years and above, based on familiarity with age cut-offs used to define ‘older’ in the literature. While 40 years of age may not be considered ‘older’ adulthood among non-drug-using populations, there is evidence that PWUD experience premature age-related pathophysiological processes, including inflammation, cellular ageing and declines in brain volume and cognitive functioning [19–21,34]. Given our interest in assessing age-related health outcomes, which may occur at younger chronological ages among PWUD compared to the general population, we decided to use as inclusive an age range as possible to conduct a broad, scoping literature search.

We included publications that met any of the following criteria:

- Reviews, commentaries or essays discussing conceptual/theoretical, clinical, epidemiological or public health issues relating to older PWUD.
- Studies where the aim was to explicitly examine experiences or outcomes of older PWUD (which may or may not be in relation to a younger group).
- Studies examining premature ageing, or outcomes that usually emerge in older adulthood or change with age, in samples of people of any age who use drugs. Outcomes of interest were not pre-defined, but evaluated during study screening. These outcomes ultimately included bone mineral density, cardiovascular health, cerebrovascular health, fall risk, frailty, geriatric non-communicable diseases, changes in hormone levels, inflammation, liver disease, mortality, neurocognitive decline, sleep quality degradation, telomere shortening, and vitamin deficiency.

There were no restrictions on included study designs, language or year of publication.

## Search strategy and study inclusion

Pubmed and Embase were searched in July 2020, and searches repeated in March 2021 to capture the most recent relevant publications. The Cochrane register was searched in November 2021. Search terms were developed based on previous systematic and scoping reviews by author S.L., and testing of various combinations of age- and drug-related terms. Search terms for each database are provided in the Supporting information. Grey literature was not included. We elected not to include conference abstracts, given the limited information that is usually provided in these. A comprehensive web search for reports and other grey literature was outside the available resources.

Literature identified in each database was uploaded to the Covidence systematic review platform for de-duplication and screening. Initial title and abstract screening, followed by full-text screening, were completed in parallel by S.L. and C.Z. Google Translate was used to read publications in languages not understood by members of the review team. Disagreements were resolved through discussion. The reference lists of included studies were reviewed to identify any additional studies of relevance.

Given our intention to capture the breadth of the literature in this area, we did not perform a risk of bias assessment of included literature [32]. We considered this appropriate, given our focus on conceptual frameworks and content areas rather than specific study results.

## Data charting and synthesis

A form for data charting was developed using Covidence. The form included bibliographic information, details of any applied theoretical or conceptual frameworks, methodological details and a list of broad content areas that we anticipated would be identified in the included studies. The data charting form was pilot-tested using five studies, then revised to include more content area options before data charting continued. Given the non-linear nature of scoping reviews [35], further adjustments to the charting form were made throughout the process as necessary, generally to accommodate a greater breadth of content areas. Studies that had already been charted were re-evaluated when this occurred. Each included study was charted independently by two team members, with resulting data charts compared. Inconsistencies were resolved through discussion between the team members who completed the charting.

Team discussions identified a need for a more flexible and inductive approach to coding. This was enabled by transferring analysis to NVivo12, a qualitative data analysis software that allows researchers to code materials at multiple levels of analysis. Each study's abstract, methods and results sections were coded by author C.Z. for both bibliographic information and content areas. Initially, codes were based on the content areas charted using Covidence; however, coding in NVivo allowed for better characterization of the range of topics within each article. The coding process is thus best characterized as both deductive (in the initial phase) and inductive (in the second phase). Following an iterative process of coding and re-coding, the

content area codes were organized hierarchically (provided in Supporting information) into major content areas and sub-areas nested within these. This hierarchy is presented in the form of a literature 'map' that includes the number of identified publications in each content area.

## RESULTS

Pubmed, Embase and Cochrane register searches returned a total of 774 references, from which 79 duplicates were removed. Of the 695 publications screened against title and abstract, 433 were excluded, leaving 262 studies to be assessed for full-text eligibility. This second round of screening led to the exclusion of 123 studies (Figure 1), leaving 139 included publications from the database search. Twenty-five more studies were added from a hand search of reference lists for a total of 164 included publications. Details of included publications are presented in Table 1.

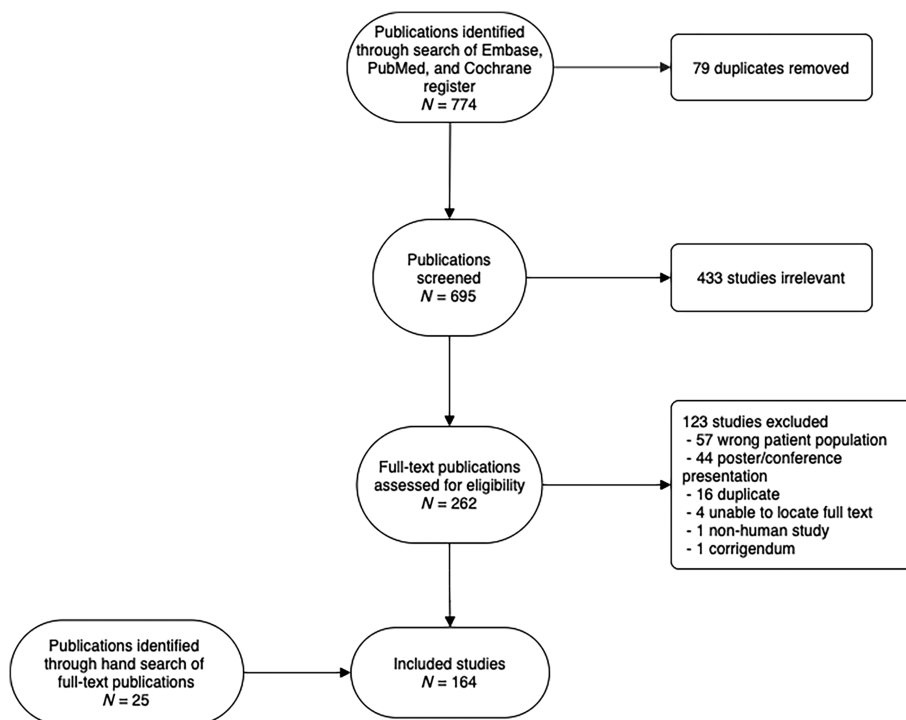
### Characteristics of included publications

Of the 164 included publications, 126 (77%) reported primary research, 19 (12%) were reviews, 15 (9%) were editorials or commentaries and four were case studies (Table 1). Primary publications included 107 quantitative studies, 16 qualitative studies and three mixed-methods studies. Of the quantitative primary studies, two-thirds presented cross-sectional data ( $n = 71$ ; 66%). A large majority ( $n = 157$ ; 96%) of reviewed publications were from high-income countries: 113 (69%) from the United States, 19 (12%) from the United Kingdom, 11 (7%) from European countries, 10 (6%) from Australia and four (3%) from Canada. Google Translate was used to read four publications (three in German, one in Spanish).

Participants in primary studies were most often recruited from drug treatment services ( $n = 45$ , 36%) or from the community, either through diversified recruitment of PWUD samples ( $n = 34$ , 27%) or via surveys conducted in the general population ( $n = 8$ , 6%). Studies that specifically focused upon 'older' PWUD most often used a cut-off of 50 years or above ( $n = 54$ , 33%), but 'older' definitions ranged from 40 years and above ( $n = 6$ ) to 70 years and above ( $n = 1$ ) (Table 1).

### Conceptual frameworks and theories applied in studying ageing and drug use

Only 16 publications (10%) explicitly applied a conceptual framework (Table 2). Of these frameworks, two focused specifically upon older adult drug use, and three investigated changes in drug use over time. The mega-interactive model of substance abuse among the elderly (MIMSAE) was explicitly proposed to help medical professionals understand drug use behaviour and diagnose substance use disorder among older adults [36]. Sober aged reflection was

**FIGURE 1** Study flow diagram

developed among older former PWUD recently released from prison, who attributed their sobriety to the specific combination of externally imposed abstinence during their incarceration and the self-reflection prompted by growing older [37]. Longitudinal studies used the life-course perspective on drug use [13,38–41] and the concept of drug use careers [13,38,42], two closely related frameworks that consider the trajectories, transitions and life events that occur during a long period of drug use. The final framework specific to ageing and drug use was that of ‘maturing-out’, which hypothesizes that people tend to stop using drugs as they approach middle age [43]. One study examined the applicability of this framework to ageing Mexican American men [41].

Other frameworks applied in included studies were not as specific to older adults who use drugs, highlighting the diversity of theoretical approaches that can be employed in this area of research. Four frameworks addressed social, cultural or institutional factors that can affect drug use: the theories of marginality [44] and intersectionality [45] focus upon the social construction of identity and its ramifications; the social determinants of health model [46] investigates non-medical factors that influence health outcomes; and the integrated causal model posits four inter-related influences on drug use behaviours and emphasizes that social factors should not be overlooked [47]. Three frameworks focused upon personality factors that may potentiate drug use: valuation theory posits that drug use rewards are over-valued compared to non-drug reinforcements [48]; expectancy theory holds that people are more likely to use drugs when they expect positive feelings to result [49,50]; and self-control theory suggests that low self-control potentiates drug use [49]. Finally, one framework, the behavioural model of health-care utilization, takes a systems

perspective to consider the social and clinical factors that affect people’s ability to access care [51].

Most included frameworks were existing theories incorporated a priori and used to guide the investigation, with the exceptions of the MIMSAAE [36] and sober aged reflection [37], which were new models of older adult drug use proposed by the included publications. Theoretical frameworks generally focused upon describing factors, processes and contexts related to drug use in order to support research regarding older adults who use drugs. Two frameworks, the behavioural model of healthcare utilization [51] and the MIMSAAE [36], focus upon health-care provision, and only the MIMSAAE is specifically addressed to clinicians treating older adults who use drugs.

## Content areas studied

The literature map derived from data charting identified seven major content areas that have been the focus of published work on ageing and older PWUD (Figure 2). One of these areas, termed ‘acknowledgement of drug use in older adults’ in Figure 2, includes publications ( $n = 64$ ; 39% of included publications) that primarily seek to highlight the fact that older adults use illicit drugs. This includes 14 editorials or commentaries calling for additional research in this area, the earliest of which were published in the 1970s [52,53], but continuing into the 2010s [54–56]. Demographic trends towards an ageing of people using drugs [4,5,57] as well as people seeking drug treatment [6,8,53,58] were noted, occasionally attributed to the greater prevalence of drug use in the ‘baby boom’ birth cohort [9–11]. Publications also noted the

**TABLE 1** Details of included publications

First author, year of publication	Country	Study design	Definition of 'older' age	Recruitment setting/database
Althoff, 2020 [120]	USA	Administrative data	≥ 55 years	CDC WONDER database
Anderson & Levy, 2003 [44]	USA	Qualitative cross-sectional	≥ 50 years	Community recruitment
Andrews, 2008 [121]	USA	Qualitative cross-sectional	≥ 65 years	Professional organizations
Armstrong, 2007 [4]	USA	Administrative data	≥ 65 years	Population survey
Arndt <i>et al.</i> , 2011 [6]	USA	Administrative data	≥ 55 years	Treatment service
AIVL, 2011 [30]	Australia	Qualitative cross-sectional	≥ 40 years	Community recruitment
Ayres <i>et al.</i> , 2012 [95]	UK	Qualitative cross-sectional	≥ 55 years	Multiple: treatment service, harm reduction service and community recruitment
Bachi <i>et al.</i> , 2017 [122]	USA	Non-systematic/clinical review	Age-related outcome(s)	Not applicable (NA)
Badrakalimuthu, 2010 [123]	UK	Non-systematic/clinical review	≥ 60 years	NA
Badrakalimuthu, 2012 [124]	UK	Quantitative cross-sectional	≥ 50 years	Treatment service
Bartzokis <i>et al.</i> , 1999 [125]	USA	Quantitative cross-sectional	≥ 46 years	Treatment service
Bartzokis <i>et al.</i> , 1999 [126]	USA	Quantitative cross-sectional	Age-related outcome(s)	Treatment service
Bartzokis <i>et al.</i> , 2000 [65]	USA	Quantitative cross-sectional	Age-related outcome(s)	Multiple: men who use cocaine from treatment settings; men who use amphetamines from the community
Bedi <i>et al.</i> , 2019 [48]	USA	Quantitative cross-sectional	≥ 50 years	Community recruitment
Benaiges <i>et al.</i> , 2013 [69]	Spain	Quantitative cross-sectional	Age-related outcome(s)	Treatment service
Beynon <i>et al.</i> , 2009 [127]	UK	Qualitative cross-sectional	≥ 50 years	Treatment service
Beynon <i>et al.</i> , 2013 [128]	UK	Qualitative cross-sectional	≥ 50 years	Treatment service
Beynon, 2010 [54]	UK	Editorial/commentary	≥ 40 years	NA
Beynon, 2013 [129]	UK	Longitudinal	≥ 40 years	Treatment service
Bird, 2020 [111]	UK	Editorial/commentary	≥ 45 years	NA
Bitar, 2014 [130]	Germany	Non-systematic/clinical review	≥ 65 years	NA
Blazer, 2009 [57]	USA	Administrative data	≥ 50 years	Population survey
Boeri & Tyndall, 2012 [47]	USA	Qualitative cross-sectional	≥ 45 years	Community recruitment
Boeri, 2011 [39]	USA	Longitudinal	≥ 45 years	Community recruitment
Capel & Peppers, 1978 [53]	USA	Longitudinal	≥ 60 years	Treatment service
Carew, 2018 [7]	Ireland	Systematic review	≥ 40 years	NA
Cepeda <i>et al.</i> , 2016 [41]	USA	Qualitative cross-sectional	≥ 45 years	Multiple: treatment services and community recruitment
Chait <i>et al.</i> , 2010 [131]	USA	Administrative data	≥ 65 years	Health-care service
Chao <i>et al.</i> , 2019 [73]	USA	Quantitative cross-sectional	≥ 50 years	Not reported

(Continues)

**TABLE 1** (Continued)

First author, year of publication	Country	Study design	Definition of 'older' age	Recruitment setting/database
Cheng <i>et al.</i> , 2013 [67]	Hong Kong	Quantitative cross-sectional	Age-related outcome(s)	Treatment service
Choi <i>et al.</i> , 2015 [49]	USA	Quantitative cross-sectional	≥ 50 years	Community recruitment
Choi <i>et al.</i> , 2016 [50]	USA	Quantitative cross-sectional	≥ 50 years	Community recruitment
Choi <i>et al.</i> , 2016 [132]	USA	Quantitative cross-sectional	≥ 50 years	Community recruitment
Choi <i>et al.</i> , 2019 [133]	USA	Quantitative cross-sectional	≥ 50 years	Community recruitment
Colliver, 2006 [10]	USA	Administrative data	≥ 50 years	Population survey
Conner, 2008 [45]	USA	Qualitative cross-sectional	≥ 50 years	Treatment service
Cotton <i>et al.</i> , 2018 [134]	USA	Editorial/commentary	≥ 50 years	NA
Crome <i>et al.</i> , 2009 [135]	UK	Editorial/commentary	Variable	NA
Crome, 2011 [110]	UK	Editorial/commentary	≥ 50 years	NA
Crome, 2013 [77]	UK	Editorial/commentary	≥ 65 years	NA
Dokkedal-Silva <i>et al.</i> , 2018 [100]	Brazil	Editorial/commentary	≥ 50 years	NA
Doukas, 2014 [103]	Canada	Non-systematic/clinical review	≥ 50 years	NA
Dowling, 2008 [19]	USA	Non-systematic/clinical review	≥ 50 years	NA
Dürsteler-MacFarland, 2011 [87]	Switzerland	Quantitative cross-sectional	≥ 50 years	Treatment service
Edelman <i>et al.</i> , 2014 [78]	USA	Non-systematic/clinical review	≥ 50 years	NA
Engel & Rosen, 2015 [136]	USA	Quantitative cross-sectional	≥ 50 years	Treatment service
Engstrom <i>et al.</i> , 2009 [137]	USA	Quantitative cross-sectional	≥ 45 years	Treatment service
Ersche <i>et al.</i> , 2013 [138]	UK	Quantitative cross-sectional	Age-related outcome(s)	Not reported
Fahmy <i>et al.</i> , 2012 [5]	UK	Quantitative cross-sectional	≥ 65 years	Population survey
Fareed <i>et al.</i> , 2009 [75]	USA	Quantitative cross-sectional	≥ 40 years	Treatment service
Felix <i>et al.</i> , 2020 [139]	USA	Non-systematic/clinical review	≥ 65 years	NA
Firoz & Carlson, 2004 [74]	USA	Quantitative cross-sectional	≥ 55 years	Treatment service
Fitzpatrick, 2011 [140]	UK	Editorial/commentary	≥ 65 years	NA
Flores <i>et al.</i> , 2014 [99]	USA	Qualitative cross-sectional	≥ 45 years	Community recruitment
Ford <i>et al.</i> , 2015 [51]	USA	Quantitative cross-sectional	≥ 50 years	Multiple: harm reduction and health-care services
Gfroerer, 2003 [9]	USA	Administrative data	≥ 50 years	Population survey
Gossop, 2008 [25]	UK	Editorial/commentary	Variable	NA

(Continues)

TABLE 1 (Continued)

First author, year of publication	Country	Study design	Definition of 'older' age	Recruitment setting/database
Green, 2017 [56]	USA	Case study/guidelines for health-care workers	≥ 65 years	NA
Grella & Lovinger, 2012 [89]	USA	Quantitative cross-sectional	≥ 50 years	Previous studies
Grella, 2011 [40]	USA	Longitudinal	Other: 30-year follow-up (mean = 58.3 years)	Treatment service
Gutiérrez-Cárceles <i>et al.</i> , 2019 [46]	Spain	Mixed methods	> 45 years old (quantitative component); ≥ 60 years old (qualitative component)	Treatment service
Hamilton & Grella, 2009 [28]	USA	Qualitative cross-sectional	≥ 50 years	Multiple: treatment service and community recruitment
Han <i>et al.</i> , 2009 [11]	USA	Mathematical modelling	≥ 50 years	Population survey
Han <i>et al.</i> , 2015 [58]	USA	Administrative data	≥ 60 years	Treatment service
Han <i>et al.</i> , 2019 [141]	USA	Administrative data	≥ 45 years	NYC death certificates and toxicology results from the Office of the Chief Medical Examiner
Han, 2020 [82]	USA	Quantitative cross-sectional	≥ 50 years	Treatment service
Hartel <i>et al.</i> , 2006 [88]	USA	Quantitative cross-sectional	≥ 49 years	Multiple: health-care service and community recruitment
Hearn <i>et al.</i> , 2015 [142]	USA	Quantitative cross-sectional	≥ 45 years	Community recruitment
Higgs & Dietze, 2017 [143]	Australia	Editorial/commentary	≥ 50 years	NA
Higgs & Maher, 2010 [144]	Australia	Editorial/commentary	≥ 50 years	NA
Hoffmann-Menzel <i>et al.</i> , 2019 [145]	Germany	Case study/guidelines for health-care workers	Not defined	NA
Hser, 2001 [13]	USA	Longitudinal	Other: 33-year follow-up (mean = 57.4 years)	Treatment service
Hser, 2004 [146]	USA	Longitudinal	Other: 33-year follow-up (mean = 58.4 years)	Treatment service
Hser, 2007 [38]	USA	Longitudinal	Other: 33-year follow-up (mean = 57.9 years)	Treatment service
Huhn <i>et al.</i> , 2018 [8]	USA	Administrative data	≥ 55 years	Treatment service
Irwin <i>et al.</i> , 2016 [97]	USA	Quantitative cross-sectional	Age-related outcome(s)	Community recruitment
Iudicello <i>et al.</i> , 2014 [71]	USA	Quantitative cross-sectional	≥ 50 years	Multiple: health-care service and community recruitment
Johns <i>et al.</i> , 2018 [147]	USA	Quantitative cross-sectional	≥ 50 years	Community recruitment
Joshi, 2019 [85]	USA	Editorial/commentary	Not defined	NA
Kalapatapu <i>et al.</i> , 2011 [92]	USA	Quantitative cross-sectional	51–70 years	Community recruitment
Kalapatapu <i>et al.</i> , 2013 [70]	USA	Quantitative cross-sectional	≥ 45 years	Treatment service
King <i>et al.</i> , 1994 [27]	USA	Non-systematic/clinical review	≥ 55 years	NA

(Continues)

TABLE 1 (Continued)

First author, year of publication	Country	Study design	Definition of 'older' age	Recruitment setting/database
Kirk <i>et al.</i> , 2017 [148]	USA	Quantitative cross-sectional	Age-related outcome(s)	Community recruitment
Kovacs <i>et al.</i> , 2015 [68]	Hungary	Quantitative cross-sectional	Age-related outcome(s)	Department of Forensic and Insurance Medicine of Semmelweis University (Budapest, Hungary)
Kuhn <i>et al.</i> , 2019 [149]	Germany	Mathematical modelling	≥ 45 years	Treatment service
Kuo <i>et al.</i> , 2016 [93]	USA	Quantitative cross-sectional	≥ 50 years	Community recruitment
Kwiatkowski <i>et al.</i> , 2003 [150]	USA	Quantitative cross-sectional	>50 years	Community recruitment
Lai <i>et al.</i> , 2018 [34]	USA	Study 1: cross-sectional; study 2: longitudinal	Age-related outcome(s)	Treatment service
Lambert <i>et al.</i> , 2014 [151]	USA	Quantitative cross-sectional	Age-related outcome(s)	Community recruitment
Lank & Crandall, 2014 [152]	USA	Administrative data	≥ 55 years	Health-care service
Leng <i>et al.</i> , 2015 [153]	USA	Quantitative cross-sectional	Age-related outcome(s)	Community recruitment
Leung <i>et al.</i> , 2017 [154]	Canada	Longitudinal	Age-related outcome(s)	Previous study: Vancouver Injection Drug Users Study (VIDUS)
Levandowski <i>et al.</i> , 2016 [155]	Brazil	Quantitative cross-sectional	Age-related outcome(s)	Treatment service
Levi-Minzi, 2013 [102]	USA	Mixed methods	≥ 60 years	Community recruitment
Levy & Anderson, 2009 [42]	USA	Qualitative cross-sectional	≥ 50 years	Community recruitment
Levy, 1998 [156]	USA	Quantitative cross-sectional	≥ 50 years	Previous study: Partners in Community Health Project
Lofwall, 2005 [157]	USA	Quantitative cross-sectional	≥ 50 years	Treatment service
Lofwall, 2008 [91]	USA	Longitudinal	≥ 50 years	Treatment service
Loreck <i>et al.</i> , 2016 [158]	USA	Non-systematic/clinical review	Not defined	NA
Lynch, 2020 [159]	USA	Quantitative cross-sectional	≥ 55 years	Treatment service
Mannelli, 2021 [23]	USA	Editorial/commentary	≥ 55 years	NA
Martin, 2020 [160]	USA	Administrative data	Age-related outcome(s)	HIV neurobehavioral research programme
Maruyama <i>et al.</i> , 2013 [80]	Canada	Quantitative cross-sectional	≥ 50 years	PharmaNet database
McCall <i>et al.</i> , 2017	USA	Mixed methods	≥ 50 years	Treatment service
Mehta, 2021 [161]	USA	Quantitative cross-sectional	Age-related outcome(s)	Community recruitment
Moeini, 2019 [162]	Iran	Quantitative cross-sectional	Age-related outcome(s)	Multiple: ELS groups from Shahid Khabushani camp; heroin-only group from treatment service
Molist <i>et al.</i> , 2018 [163]	Spain	Administrative data	≥ 40 years	Treatment service

(Continues)



TABLE 1 (Continued)

First author, year of publication	Country	Study design	Definition of 'older' age	Recruitment setting/database
Mostafavi, 2020 [164]	Iran	Quantitative cross-sectional	Age-related outcome(s)	Health-care service
Nagarajan, 2019 [165]	Australia	Case study/guidelines for health-care workers	Not defined	NA
Nakama <i>et al.</i> , 2011 [66]	USA	Quantitative cross-sectional	Age-related outcome(s)	Multiple: treatment service and community recruitment
Nguyen <i>et al.</i> , 2017 [166]	USA	Qualitative cross-sectional	≥ 50 years	Harm reduction service
Odani, 2020 [167]	USA	Administrative data	≥ 50 years	Population survey
Pagliari & Pagliaro, 1992 [36]	Canada	Editorial/commentary	Not defined	NA
Paolillo <i>et al.</i> , 2019 [168]	USA	Quantitative cross-sectional	Age-related outcome(s)	Previous study: subset of multi-dimensional successful ageing among HIV-infected adults study
Pascarelli & Fischer, 1974 [52]	USA	Quantitative cross-sectional	≥ 60 years	Housing service
Pieper <i>et al.</i> , 2012 [24]	USA	Quantitative cross-sectional	≥ 50 years	Treatment service
Pierce <i>et al.</i> , 2018 [76]	UK	Administrative data	≥ 45 years	Treatment service
Piggott <i>et al.</i> , 2013 [61]	USA	Longitudinal	Age-related outcome(s)	Community recruitment
Piggott <i>et al.</i> , 2015 [62]	USA	Longitudinal	Age-related outcome(s)	Community recruitment
Piggott <i>et al.</i> , 2017 [63]	USA	Longitudinal	Age-related outcome(s)	Community recruitment
Piggott <i>et al.</i> , 2020 [64]	USA	Longitudinal	Age-related outcome(s)	Community recruitment
Pottieger <i>et al.</i> , 1981 [169]	USA	Quantitative cross-sectional	≥ 50 years	Community recruitment
Rajaratnam <i>et al.</i> , 2009 [104]	USA	Quantitative cross-sectional	≥ 55 years	Treatment service
Ramadan, 2020 [170]	USA	Administrative data	≥ 50 years	Population survey
Reece & Hulse, 2013 [171]	Australia	Longitudinal	Age-related outcome(s)	Multiple: health-care service and university
Reece & Hulse, 2013 [172]	Australia	Quantitative cross-sectional	Age-related outcome(s)	Health-care service
Reece, 2007 [173]	Australia	Quantitative cross-sectional	Age-related outcome(s)	Health-care service
Reece, 2012 [174]	Australia	Quantitative cross-sectional	Age-related outcome(s)	Health-care service
Richard <i>et al.</i> , 2000 [86]	USA	Quantitative cross-sectional	≥ 55 years	Community recruitment
Roe <i>et al.</i> , 2010 [29]	UK	Qualitative cross-sectional	≥ 49 years	Treatment service
Rosen <i>et al.</i> , 2008 [79]	USA	Quantitative cross-sectional	≥ 50 years	Treatment service
Rosen <i>et al.</i> , 2011 [175]	USA	Systematic review	≥ 50 years	NA
Rosen <i>et al.</i> , 2011 [176]	USA	Non-systematic/clinical review	≥ 50 years	NA
Rosen, 2004 [84]	USA	Administrative data	≥ 50 years	Treatment service
Rosenberg, 1995 [177]	USA	Non-systematic/clinical review	Variable	NA
Salter <i>et al.</i> , 2011 [59]	USA	Longitudinal	Age-related outcome(s)	Community recruitment

(Continues)

TABLE 1 (Continued)

First author, year of publication	Country	Study design	Definition of 'older' age	Recruitment setting/database
Sanborn, 2020 [83]	USA	Administrative data	Age-related outcome(s)	Treatment service
Santoro <i>et al.</i> , 2005 [178]	USA	Quantitative cross-sectional	Age-related outcome(s)	Not reported
Santoro <i>et al.</i> , 2007 [179]	USA	Quantitative cross-sectional	Age-related outcome(s)	Multiple: treatment services, health-care services and community recruitment
Sanvicente-Vieira <i>et al.</i> , 2016 [72]	Brazil	Quantitative cross-sectional	≥ 60 years	Treatment service
Schonfeld, 2000 [180]	USA	Quantitative cross-sectional	≥ 60 years	Health-care service
Schuler, 2019 [181]	USA	Quantitative cross-sectional	≥ 50 years	Community recruitment
Searby <i>et al.</i> , 2015a [55]	Australia	Non-systematic/clinical review	Variable	NA
Searby <i>et al.</i> , 2015b [81]	Australia	Systematic review	≥ 65 years	NA
Shah & Fountain, 2008 [182]	UK	Editorial/commentary	Variable	NA
Sharma <i>et al.</i> , 2010 [183]	USA	Longitudinal	≥ 49 years	Community recruitment
Shu, 2020 [184]	USA	Administrative data	Age-related outcome(s)	Health-care service
Shukla & Vincent, 2020 [185]	Thailand	Non-systematic/clinical review	Age-related outcome(s)	NA
Sidhu <i>et al.</i> , 2012 [186]	UK	Administrative data	≥ 45 years	Treatment service
Simoni-Wastila & Yang, 2006 [187]	USA	Systematic review	≥ 50 years	NA
Smith & Rosen, 2009 [98]	USA	Qualitative cross-sectional	≥ 50 years	Treatment service
Smith <i>et al.</i> , 2014 [90]	USA	Quantitative cross-sectional	≥ 45 years	Harm reduction service
Snyder & Platt, 2013 [22]	USA	Case study/guidelines for health-care workers	Variable	NA
Soder <i>et al.</i> , 2020 [188]	USA	Quantitative cross-sectional	≥ 50 years	Unclear
Taylor, 2012 [2]	USA	Non-systematic/clinical review	Variable	NA
Torres <i>et al.</i> , 2011 [101]	USA	Quantitative cross-sectional	≥ 45 years	Community recruitment
Vallecillo <i>et al.</i> , 2020 [60]	Spain	Quantitative cross-sectional	≥ 50 years	Treatment service
Van Santen <i>et al.</i> , 2018 [189]	The Netherlands	Administrative data linkage	Age-related outcome(s)	Multiple: Amsterdam cohort studies and treatment services
Wang <i>et al.</i> , 1997 [190]	USA	Quantitative cross-sectional	Age-related outcome(s)	Community recruitment
Weiss & Petry, 2013 [191]	USA	Quantitative cross-sectional	≥ 45 years	Treatment service
Whitehead <i>et al.</i> , 2014 [192]	USA	Quantitative cross-sectional	≥ 45 years	Multiple: community recruitment and local service agencies
Whitehead <i>et al.</i> , 2014 [96]	USA	Quantitative cross-sectional	≥ 45 years	Multiple: community recruitment and local service agencies

(Continues)

**TABLE 1** (Continued)

First author, year of publication	Country	Study design	Definition of 'older' age	Recruitment setting/database
Wu & Blazer, 2011 [26]	USA	Non-systematic/clinical review	≥ 50 years	NA
Wyse, 2018 [37]	USA	Qualitative cross-sectional	≥ 49 years	Community recruitment

under-diagnosis and misdiagnosis of drug use among older adults ( $n = 24$ ), and made recommendations regarding public health policy to most effectively serve this population ( $n = 4$ ).

The major content area with the most numerous publications ( $n = 129$ ; 79%) was health status. Sub-areas included ageing processes and indicators ( $n = 76$ ); diseases, including infectious ( $n = 51$ ) and non-communicable ( $n = 24$ ); mental health (most often the prevalence of anxiety and/or depression) ( $n = 60$ ); mortality ( $n = 19$ ); chronic pain ( $n = 16$ ); sexual health ( $n = 9$ ); venous damage ( $n = 10$ ); diet and nutrition ( $n = 6$ ); and chronic wounds ( $n = 1$ ). The largest sub-area, ageing processes and indicators, was further broken down into bodily health and brain health. Bodily health was assessed in terms of cardiovascular health ( $n = 15$ ), inflammation ( $n = 8$ ), fall risk ( $n = 8$ ), frailty ( $n = 6$ ), immune system functioning ( $n = 2$ ), reproductive hormones ( $n = 2$ ), bone mineral density ( $n = 1$ ) and mobility impairment ( $n = 1$ ). Publications noted that the presence of multiple health issues was common [59,60]. Certain physical health indicators, such as frailty and inflammation, were typically discussed in relation to HIV infection [61–64]. Brain health included studies of cognitive functioning ( $n = 31$ ), brain volume, structure or functioning ( $n = 8$ ), degradation of sleep quality ( $n = 5$ ), telomere length ( $n = 5$ ) and DNA methylation ( $n = 3$ ). Studies of brain health investigated both measurements of the brain itself [65–68] and measurements of cognitive performance [69–73].

Another major content area was health services ( $n = 109$  publications, 66%), which notably included far more publications discussing treatment for substance use disorders ( $n = 99$ ) than other types of harm reduction services ( $n = 9$ ). The large treatment for substance use disorders sub-area included considerations pertaining to opioid agonist treatment ( $n = 65$ ), the age-specific needs of older adults in treatment ( $n = 24$ ), treatment-seeking ( $n = 18$ ), substance use disorder diagnoses ( $n = 13$ ), treatment retention ( $n = 6$ ) and proposed treatments specific to older adults who use drugs ( $n = 6$ ). The publications regarding opioid agonist treatment (OAT) discussed outcomes among OAT clients ( $n = 42$ ), participants' histories of OAT ( $n = 31$ ), OAT demographics ( $n = 16$ ), people's perceptions of OAT ( $n = 6$ ) and the relative merits of the opioid agonists used in treatment ( $n = 4$ ). Primary publications often studied populations of older adults receiving drug treatment, particularly people on OAT [74–76]. Editorials and commentaries called for the adaptation of treatment programmes, especially OAT, to better serve older adults [26, 77, 78]. Studies of OAT clients often investigated health-related outcomes, including the prevalence of comorbid conditions [79–82], cognitive functioning [83], infectious disease progression [78] and mortality risk [75,76], as

well as the prevalence of illicit drug use among OAT clients [78,81,84,85]. Other health service sub-areas were medication ( $n = 13$ ), hospitalization ( $n = 12$ ) and palliative care ( $n = 5$ ), as well as the utilization ( $n = 21$ ), accessibility ( $n = 17$ ) and client perception ( $n = 5$ ) of health services.

The major content area of drug use practices and patterns among older people ( $n = 84$  publications, 51%) included participants' histories of injection drug use ( $n = 38$ ), histories of drug use initiation ( $n = 23$ ), the effects of drug consumption at older ages ( $n = 15$ ), drug use culture ( $n = 14$ ), drug use risk ( $n = 13$ ) and protective ( $n = 8$ ) behaviours among older adults, cessation of drug use ( $n = 9$ ), the strategies people used to obtain drugs ( $n = 9$ ), drug use trajectories over time ( $n = 5$ ) and drug selling ( $n = 4$ ). Publications often discussed differences and similarities in drug use behaviours between older and younger adults [86,87] or between groups of older adults [88–90]. Some publications focused upon drug use behaviours reported by adults entering or in treatment [29,91], while others described practices among people not seeking treatment [92,93].

The social environments of older adults who use drugs were examined in 74 publications (45%), including sub-areas regarding familial or partner relationships ( $n = 33$ ), employment ( $n = 26$ ), educational attainment ( $n = 20$ ), social support ( $n = 18$ ), stigmatization ( $n = 20$ ), housing/accommodation ( $n = 15$ ), social isolation ( $n = 14$ ), social roles or social status ( $n = 11$ ), mistrust of others ( $n = 6$ ) and cultural values ( $n = 2$ ). The social environments of older adults who use drugs were reported descriptively [94,95], particularly regarding employment [96], educational attainment [97], housing status [93] and marital status [79]. Other publications considered elements of the social environments, such as social isolation [98] and stigmatization [45], as outcomes of drug use, or as predictors of drug use and harm reduction behaviours among older adults [47,49,84,99,100].

Twenty-eight publications (17%) referred to the criminal legal system, including incarceration ( $n = 15$ ), policing ( $n = 6$ ) and driving under the influence ( $n = 2$ ). While some papers reflected older adults' fear of or experiences with the criminal legal system [28,37], incarceration history was most often used to describe the study population or to distinguish between comparison groups [101,102].

Fifteen publications (9%) discussed quality of life for older PWUD. The two sub-areas were daily life functioning ( $n = 6$ ) and life review and reflection ( $n = 4$ ), an activity associated with older adulthood. Most publications used 'quality of life' as a general term to encompass many facets of health and wellbeing (e.g. Doukas, 2014)

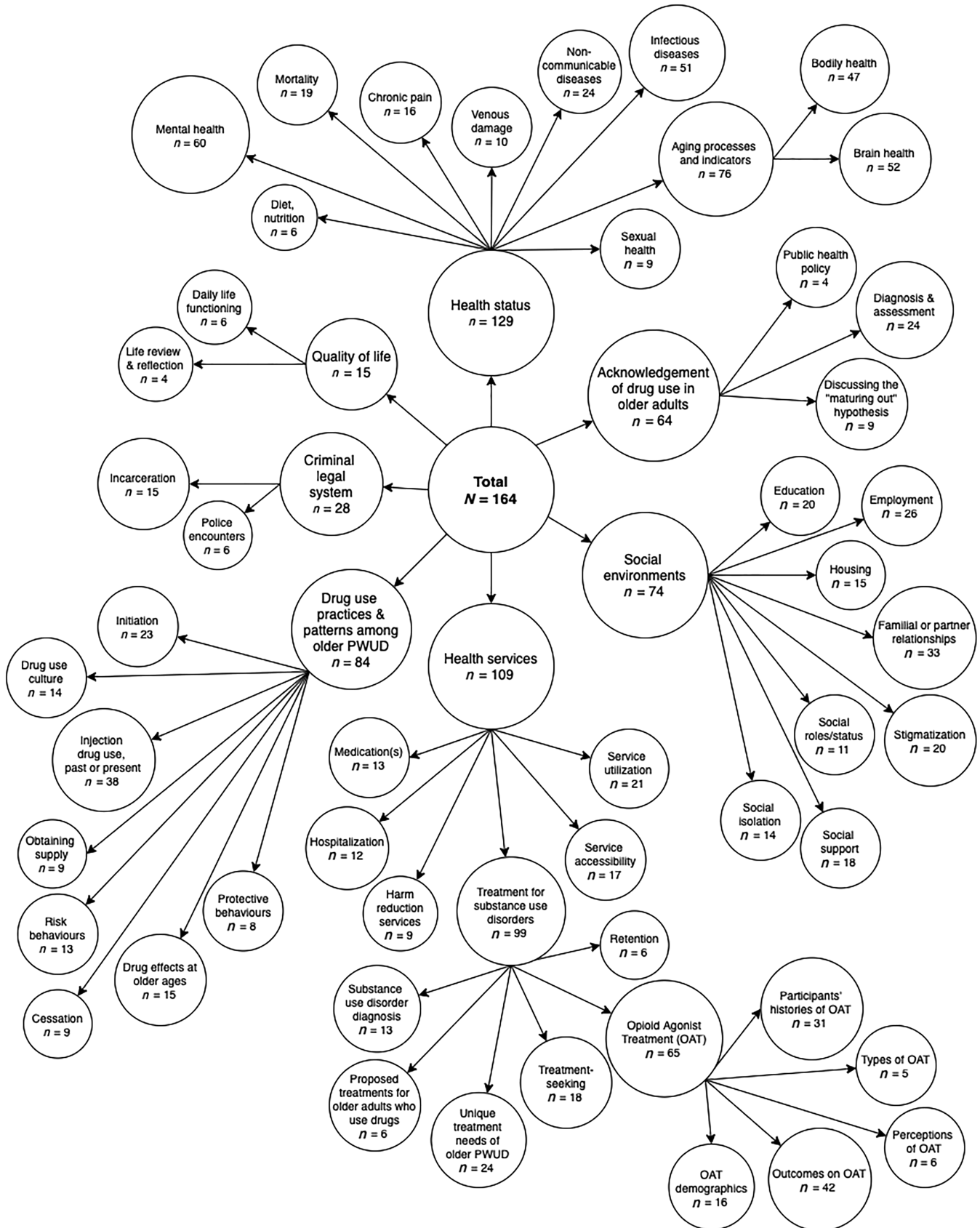
**TABLE 2** Theories and conceptual frameworks applied in the study of ageing and older people who use drugs

Theory/framework	Description	Publication(s) using the framework
Marginality	A 'marginal' person occupies a liminal space between two cultures. Older people who inject drugs may represent a previous drug culture era; unable to fully assimilate into the norms of an emerging drug culture, they are socially isolated and vulnerable	Anderson & Levy (2003) [44]
Valuation theory	Substance use disorders are perpetuated by an overvaluation of drugs coupled with an undervaluation of non-drug reinforcements. An undervaluation of social rewards could be particularly problematic for older adults who use drugs, as social integration is an important factor in healthy ageing	Bedi <i>et al.</i> (2019) [48]
Integrated causal model	There are four inter-related influences on drug use and risk behaviours: genetic predispositions; brain biochemistry; psychological factors, such as early childhood trauma and psychological disorders; and social factors, including neighbourhood drug availability and social networks. Boeri & Tyndall (2012) suggest that problematic drug use should be addressed by a greater focus on social conditions	Boeri & Tyndall (2012) [47]
Life-course perspective on drug use/drug use trajectories	The life-course perspective examines trajectories of drug use over time. Boeri and colleagues (2011) proposed mathematical measures to quantify drug use trajectories and transitions over time. Cepeda and colleagues (2016) used a life-course perspective to examine the applicability of Winick's 'maturing out' concept to ageing Mexican American men. Grella & Lovinger (2011) found four trajectories heroin use over a 30-year period: rapid decrease, moderate decrease, gradual decrease and no decrease. They examined factors associated with membership in each trajectory. Hser and colleagues (2001) analyzed the long-term patterns and consequences of heroin use over 33 years in a sample of men who had been in drug treatment in the 1960s. Hser and colleagues (2007) also identified three distinct trajectories within this cohort: stably high use, late decelerated use, and early cessation	Boeri <i>et al.</i> (2011) [39]; Cepeda <i>et al.</i> (2016) [41]; Grella & Lovinger (2011) [40]; Hser <i>et al.</i> (2001) [13]; Hser <i>et al.</i> (2007) [38]
'Maturing out'	Winick (1962) proposed that most PWUD either die or age out of use in their 30s. Cepeda and colleagues (2016) evaluated this model among older Mexican American men who inject heroin and found not a 'maturing out' but rather a 'maturing in' process of social re-adjustment that returned men who use heroin to a stable maintenance pattern of use rather than a recovery phase, ultimately prolonging their drug use into later life	Cepeda <i>et al.</i> (2016) [41]
Expectancy theory	People engage in a behaviour when they expect positive or reinforcing outcomes as a result of the behaviour. People with more positive expectations about drug use are more likely to use drugs, use greater quantities and drive under the influence of drugs	Choi <i>et al.</i> (2015) [49]; Choi <i>et al.</i> (2016) [50]
Self-control theory	Low self-control potentiates deviant behaviours, including drug use and driving under the influence of drugs	Choi <i>et al.</i> (2015) [49]
Intersectionality	People may be categorized by many different social identities simultaneously, including their race, class and gender. These categories overlap to yield discrimination and privilege. Older adults on opioid agonist treatment can face	Conner & Rosen (2008) [45]

(Continues)

TABLE 2 (Continued)

Theory/framework	Description	Publication(s) using the framework
Behavioural model of health-care utilization	<p>multiple, intersecting stigmas regarding their age, drug use, mental health status and medications, use of OAT, poverty, race and HIV status.</p> <p>A systems perspective that considers individual, environmental and provider-related variables associated with patients' decisions to seek care. Ford and colleagues (2015) use this model to assess age-related disparities in HIV testing among clients in settings with high HIV prevalence. HIV testing is influenced by clinical context, as well as factors predisposing someone to obtain a test (e.g. demographics), enabling access to testing (e.g. having a usual source of health-care) and indicating a need for a test (e.g. risk behaviours)</p>	Ford et al. (2015) [51]
Social determinants of health	<p>Social determinants of health are any non-medical factors that influence health outcomes. Gutiérrez-Cáceres and colleagues (2019) used this framework to emphasize the lack of social support and high prevalence of non-communicable diseases among older adults on methadone maintenance treatment. Ongoing stigmatization combined with a lack of resources for ageing adults increases this population's vulnerability</p>	Gutiérrez-Cáceres et al. (2019) [46]
Drug use career	<p>A career is a central organizing principle of a person's life, defining certain appropriate roles, relationships and behaviours for them. As someone who uses drugs ages, their drug use career can interact with their older-adult career in a number of ways. For example, age may stifle drug career mobility as older adults find themselves sidelined in the drug market. Hser and colleagues (2001, 2007) used 'career' to mean something closely analogous to life-course trajectory, looking at patterns of drug use behaviour over time. Levy &amp; Anderson (2005) considered ageing as a drug use career contingency, reshaping roles and relationships among their older adult participants</p>	Hser et al. (2001) [13]; Hser et al. (2007) [38]; Levy & Anderson (2009) [42]
The mega-interactive model of substance abuse among the elderly (MIMSAE)	<p>A proposed model to help health-care providers recognize, understand and treat older adults who use alcohol or drugs. There are four inter-related dimensions: the 'elderly person' dimension (including physical and psychological characteristics of an individual), the 'substances of abuse' dimension (a person's preferred drugs and use patterns), the societal dimension (including social relationships and cultural/institutional factors) and the time dimension (including historical period, period of a person's life and length of time using drugs).</p>	Pagliaro & Pagliaro (1992) [36]
Sober aged reflection	<p>Older age catalyzes a period of reflection and evaluation of one's life, including a heightened awareness of mortality. In combination with a period of sobriety, this self-reflection can lead to cognitive change and cessation of drug use. Wyse (2018) developed this model in a study of ageing men recently released from prison</p>	Wyse (2018) [37]



**FIGURE 2** Content areas in reviewed publications. Publication counts are not mutually exclusive, as publications could discuss multiple content areas. This diagram is simplified for the sake of visual clarity; additional levels of content area breakdown are provided in the Supporting information

[103]. Only one publication specifically operationalized quality of life, using subscales including overall social support, personal wellbeing, and satisfaction with life [104].

## DISCUSSION

This scoping review suggests that research on ageing and older PWUD is under-theorized. At the most fundamental level, there is a lack of consensus as to the definition of 'older' age in PWUD, with definitions ranging from 40 years and above to 70 years and above. That this population has grown is undisputed in the literature [8,23,30]. However, it is unclear to what extent evolving incidence rates of illicit drug use and overdose epidemics will impact upon mortality rates and the prevalence of drug use among older people in future [105–107]. There is a need to develop shared theories and frameworks and improve methodological rigour; clearly define and characterize the population of interest; shift from description to explanation; collect data on particularly marginalized older PWUD (e.g. women, racialized minorities, sexual and gender minorities); and undertake research in a broader range of national and economic contexts.

All the theoretical frameworks identified in included publications were drug research frameworks. There is an opportunity to incorporate theoretical frameworks from the ageing field to strengthen and expand the conceptual underpinnings of this research. The well-established concept of 'successful ageing', for example, has three components: the absence of disease or disability, the maintenance of cognitive and physical functioning, and ultimately an active engagement with life [108]. Such active engagement may be especially challenging for older PWUD, given their experiences of stigma due to both their age and their drug use [29,45,46] and premature ageing that may impact upon mobility. Our literature map suggests that disease in particular has been investigated in older PWUD, but there has been less focus upon understanding and supporting functional abilities and active engagement with life. Integration of the successful ageing perspective and other existing theories of ageing could serve as a useful catalyst for the progression of this research area.

This review also mapped the literature in this field onto seven major content areas. Much of the identified literature is concerned with health status—usually illness and disease—and although unstated, adopts a biomedical approach to health and ageing. Despite this biomedical focus, we found little work regarding the biological underpinnings of substance use among older adults. Additionally, there is limited work that seeks to provide broader context regarding the lives of older PWUD, including their social environments and quality of life. These are critical aspects of healthy ageing, and research in these areas is essential to contextualize biomedical findings. Indeed, psychosocial factors and life events associated with ageing (e.g. loss of loved ones, disability or loss of independence) may influence and interact with drug use behaviours. Greater development and use of theoretical frameworks would improve understanding of the links between the physical and social–environmental aspects of ageing and support the

development of a more cohesive body of work with shared theories and definitions.

## Research priorities

The review has highlighted several further implications for future research in this area. Studies exploring the specificities of ageing as a woman or a racialized person who uses illicit drugs were rare among our included publications, and will be critical to progression in the field. Additionally, almost all identified publications were conducted in high-income countries. Although the average age of PWUD in low- and middle-income countries is younger than that in high-income countries, this may shift in coming years [109]. Many of the publications we identified were editorials and commentaries noting the increasing need for data to inform substance use treatment for this population, commencing in the 1970s and continuing into the present decade [52,110,111]. On the basis of the findings here, it would appear that data to support clinical care of older PWUD are still lacking, with few studies reporting on adapted treatment services for this population and none on primary care models or chronic disease care models. This is a major knowledge gap. Within addiction medicine, care for PWUD has not traditionally focused upon an older cohort with emerging health issues related to ageing. Conversely, the primary and geriatric care sectors are likely to have increasing contact with older PWUD, but are unaccustomed to the specific complexities of providing care for this population, including their frequent distrust of mainstream health-care settings [98], complex pain management needs [112,113] and clinical approaches to providing care in the context of ongoing drug use [18,114]. The need to bridge discipline-based 'silos' has been frequently noted in the care of PWUD, usually in relation to mental health [115,116] and infectious diseases [117]; such work is also needed here.

Much of the literature regarding drug use and ageing is cross-sectional, limiting capacity to understand cause and effect. The few longitudinal studies we identified were largely undertaken in the context of the effects of HIV infection in an ageing cohort with a history of injecting drug use, but with many participants no longer using drugs. Community-based cohorts of older people who continue to use drugs regularly are needed to explore a broader range of research questions on transitions into older age, physical and social aspects of ageing and access to care, among others. Older people's use of harm reduction services such as needle and syringe programmes or supervised consumption/injection sites was not studied, constituting another large gap in knowledge. Harm reduction sites were also rarely used for study recruitment, and clients accessing these services may differ from treatment clients in important ways. How these services are perceived by older clients and opportunities for harm reduction services to support older clients as they age are key questions for further research. Only one included study had significant involvement of PWUD in all stages of the research project (and in fact was solely the product of a community-based organization) [30]. Meaningful involvement of PWUD in the co-creation of research projects will have

significant benefits in terms of identifying priority research questions, building the credibility of projects with intended participants and producing findings that are relevant to communities and other key stakeholders.

### Limitations of this review

This review made use of a broad search strategy without limitations on language or year of publication. We searched two databases to identify studies for inclusion; although these are the two databases that produce the most unique citations of major bibliographic databases [118], it is possible that some publications may not have been identified. We do not anticipate that the content areas of missed studies would result in any major changes to the content map as presented. Although some scoping review methodologists suggest an optional stakeholder consultation phase of the review to inform the interpretation of findings [119], we did not undertake such a consultation.

### CONCLUSION

As many commentaries and editorials have noted, older PWUD have increased in number. However, there has been limited research to inform clinical care for this population, or to understand their broader experiences of growing older. This body of work would benefit from greater theorization and methodologically rigorous research to enable causal conclusions.

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### DECLARATION OF INTERESTS

None.

### AUTHOR CONTRIBUTIONS

**Camille Zolopa:** Conceptualization; data curation; formal analysis; investigation; methodology; visualization; writing - original draft preparation. **Stine Hoj:** Conceptualization; writing - review and editing. **Nanor Minoyan:** Conceptualization; writing - review and editing. **Julie Bruneau:** Conceptualization; writing - review and editing. **Iuliia Makarenko:** Conceptualization; writing - review and editing. **Sarah Larney:** Conceptualization; formal analysis; funding acquisition; methodology; resources; supervision; writing - review and editing.

### ORCID

Julie Bruneau  <https://orcid.org/0000-0002-3484-6456>

Sarah Larney  <https://orcid.org/0000-0002-5602-4963>

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## SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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