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Research article

Investigating suicide in agriculture globally: A scoping review of methodological approaches and a roadmap for future research

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Abstract

Increased attention to suicide in agriculture has led to an increase in interventions informed in part by research on who is most likely to die from suicide, using what means, and for what reason(s). However, the limited understanding of how suicide is studied and the limited engagement in previous studies with theories raises questions about the body of knowledge underpinning these interventions. To assess prevailing methodological approaches and the implications of gaps in our understanding of suicide, we conducted a scoping review of 108 English-language articles. The use of the prevailing health science model to conduct literature reviews also provides a space to reflect on the knowledge that is missed or obscured when using overly positivistic approaches to identify and summarize bodies of literature. We find that the prevailing approaches to studying suicide are methodologically narrow, overplay a limited set of individual-level factors, and underplay key structural-level factors. In line with previous critics, our review hints at the inadequacy of existing interventions given that the existing body of knowledge has not adequately incorporated theoretically important drivers of suicide. Our reflections on current approaches to conducting literature reviews and gaps in the suicide literature provide a roadmap to bridge disciplinary traditions while helping address the knowledge gaps we have identified.

KEYWORDS: agriculture population, farmers, suicide, literature review, social determinants of mental health

Introduction

Increased attention to the mental health plight of the agricultural population, including suicide, has led to an increase in interventions in recent years in many countries (Inwood et al., 2019; Shortland et al., 2023; Younker et al., 2021). These interventions have taken several forms, including training to recognize and address the signs of mental health challenges and suicidal thoughts and behaviors, creating social spaces to facilitate peer-to-peer interactions, crisis hotlines, and financial assistance to enable individuals to seek assistance from a mental health provider. The deployment of these interventions is certainly crucial given the high rates of mental health challenges and suicide in the agricultural community and the broader connections to the resilience of the food supply (Behere, 2009; Boxer et al., 1995; Daghagh Yazd et al., 2019; Klingelschmidt, 2018; Sanne et al., 2004). Nevertheless, our understanding of the reach and effectiveness of these interventions is limited. Few of these interventions have been formally evaluated, and the existing evaluations point to mixed findings and, at times, limited efficacy at best (Brumby et al., 2013; Cuthbertson et al., 2022; Derringer et al., 2021; Hagen, 2019; M. Perceval et al., 2020; Price, 2012; Younker & Radunovich, 2021). Scholars have pointed to the inadequacy of some of these interventions, given their focus on the manifestation of mental health challenges over addressing the root causes of these issues (DeLind, 1986; Heaberlin et al., 2023; Henning-Smith et al., 2021; Inwood et al., 2019; Price, 2012).

Mental health interventions for the agricultural sector have, in part, been informed by research. Looking specifically at suicide in agriculture, several literature reviews have provided a synthesis of findings around who is most likely to die by suicide, using what means, and for what reason(s) (Freire et al., 2013; Kennedy et al., 2014; Klingelschmidt, 2018; Reed, 2020). Largely missing from this body of work is an understanding of the processes by which this body of knowledge has been generated. We are only aware of one literature review that has explored components of the methodological approach through a focus on intended goals and disciplinary grounding of studies from Australia and India (Ramadas et al., 2017). Nonetheless, an in-depth understanding of the methodological approaches used is crucial, given that variations in research paradigms and research designs have bearings on the findings (Bunge, 2017; Godfrey-Smith, 2009; Rosenberg, 2011). Here, the intention is not to argue that there is "one" right way to study suicide. Rather, it is to say that given that suicide is a complex and multifactorial social and public health issue (Stark et al., 2011; Wray et al., 2011), a holistic and nuanced understanding of suicide in agriculture will likely come from a diversity of research approaches. In addition to understanding the methodological approaches used, an understanding of what researchers set out to focus on in their study is crucial. Indeed, and

perhaps aside from a strictly inductive approach to research, what researchers decide to focus on at the onset of their study versus not heavily shapes the findings. Theories and conceptual frameworks usually inform what researchers will focus on. This includes a discipline's conceptualization of the meaning of suicide. Reading the literature over the years, it became apparent to us that studies seem to be primarily driven by empirical insights and seldom include an explicit connection to a theory or conceptual framework. What constitutes a theory or conceptual framework and the ways in which they are applied vary across disciplines. Nonetheless, theory, and to a lesser extent, conceptual frameworks, enable us to build on and refine our understanding of the natural and social worlds by moving beyond the specifics of a particular set of data and incorporating pre-existing knowledge. The limited engagement with theory as it pertains to suicide in agriculture means that the current literature might focus on factors that are not theoretically important or supported by previous research while it might ignore or underplay factors that are theoretically important.

To understand which research designs have been used to study suicide in agriculture, which factors have been emphasized, and the implications of the gaps identified on our understanding of suicide in agriculture, we conducted a scoping review of the peer-reviewed literature. Ultimately, our goal with this review is to develop a research agenda to deepen and refine the body of knowledge, which can then be leveraged for the development and refinement of suicide prevention interventions in agriculture. Our scoping review is based on 108 English-language empirical studies identified through the preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework (Page et al., 2021). We used two frameworks to review these articles: one focused on the research design and one focused on the factors based on the social determinants of mental disorders framework, as synthesized by Lund et al. (2018). While suicide is not simply, and always, connected to a mental health disorder, we choose to use the social determinants of mental health disorders framework to assess factors studied for two reasons. First, suicide is the outcome of a complex interplay of factors. This framework enables us to capture the non-medical determinants shaping suicidal behavior, including factors underpinned by the structural distribution of resources and social stratification (Marmot, 2005). In other words, this is a framework that speaks to individual and structural level factors (respectively referred to as proximal and distal factors in the framework). As such, it speaks to the disciplinary convergence in sociology, psychology, public health, anthropology, and suicidology to adopt more holistic approaches in the study of mental health challenges (Chandler, 2020), including suicide.

At first glance, it might appear paradoxical that we conducted this scoping review using an overtly positivist approach from the health sciences. Indeed, we noted above the importance of a diversity of research paradigms to build bodies of knowledge, and we chose to submit this article to an anthropology journal. Health sciences are one of the main disciplinary approaches underpinning the agricultural health and safety field (the other being engineering) (Donham et al., 2016), and the agricultural health and safety field has greatly increased its attention to suicide in recent years. We propose that adopting a health sciences model to conduct this literature review provides an opportunity to summarize the existing body of literature and to reflect on the types of knowledge that receive the most attention, along with those that are obscured. This opportunity for reflection pertains both to how suicide is studied and how bodies of knowledge are generally identified and summarized in the fields of agriculture and health and safety.

Our article makes at least two contributions. First, our assessment of research designs and social determinants included in previous studies contribute to the agricultural health and safety field and broader suicide-related fields by providing new insights into how current methodological approaches have shaped the body of knowledge and where they fall short. Previous assessments of approaches to studying suicide among the general population have been based solely on articles extracted from top-tier disciplinary journals (Hjelmeland et al., 2010; Wray et al., 2011). By extending the types of journals included in a review, our article provides a more comprehensive and diverse assessment of how suicide has been studied. Second, our reflections on what current approaches shed light on and what they obscure, including the contributions of anthropologists, coupled with proposed avenues for future research, provide a roadmap to bridge disciplinary traditions while helping address the knowledge gaps we have identified. It is our intent to propose a roadmap that provides avenues to uplift past contributions in the space of agricultural suicide research, including those from rural social scientists while pointing to future contributions they can make to the growing body of literature on suicide in agriculture. For example, this roadmap highlights the need for scientists from multiple disciplines, including anthropology, to contribute to this field of study (Daniel Münster et al., 2015).

Brief overview of the study of suicide

We precede the presentation of our scoping review with a brief overview of how suicide has been studied among the general population. In particular, we summarize five key disciplines involved in this work: psychology, psychiatry, sociology, anthropology, and

suicidology. We include these disciplines' traditional areas of focus and research designs used. Doing so provides the background to compare and contrast how suicide among the general population has been studied, compared to the agricultural population. It also provides the background to reflect on where prevailing approaches may be falling short. Given space constraints, we acknowledge this brief overview cannot adequately present the breadth and depth of these extensive bodies of literature, and invite interested readers to consult the references we have cited.

Psychology and psychiatry, which are respectively grounded in philosophy and health sciences, extensively focus on individual-level behavioral and biological factors to understand suicide (American Psychiatric Association, n.d.; American Psychological Association, n.d.; O'Connor et al., 2014). While these two disciplines do consider the role of larger environments in which individuals are embedded and how those contexts impact suicidal thoughts and behaviors, these larger environments are primarily captured through individuals' perceptions (Mueller et al., 2021). Sociology and anthropology, perhaps the two most prominent social science disciplines, seek to understand suicide by considering individual level-factors, as well as the role of social, cultural, environmental, political, and economic factors (Daniel Münster & Broz, 2015; Nettleton, 2021; Singer et al., 2020). In other words, for sociologists and anthropologists, suicide is much broader than an individual act at a particular time. Indeed, for sociologists, suicide is the byproduct of a social act with social networks, social norms, and societal structures shaping the act (Mueller et al., 2021; Wray et al., 2011). For anthropologists, suicide is not simply the clinical manifestation of ill-being nor simply its structural manifestation. Rather, suicide must be understood relationally in the context of one's life course and one's social interactions with variations across individuals and across socio-cultural contexts (Grubinger et al., 2010; Daniel Münster & Broz, 2015; Staples et al., 2012; Sterling et al., 2022). Last, suicidology is an interdisciplinary science that draws on and merges psychology and sociology to understand suicidal behaviors, their causes, and effective suicide prevention interventions. As such, suicidology can be viewed as a subspecialty to these other disciplines in that a suicidologist draws upon traditions from other fields while having specific training in the study of suicide as a health outcome (Berman et al., 2021).

While moving away from traditional disciplinary silos can be difficult, scholars have argued that drawing upon a variety of disciplines that are grounded in different theoretical and methodological paradigms is key to developing a complex and nuanced understanding of suicide (Hjelmeland et al., 2011; Mueller et al., 2021; Wray et al., 2011). Our

choice to use the social determinants of mental disorders framework to map out which factors have been studied is informed by these calls since this framework represents the merging of insights developed across the years from a range of disciplines (Lund et al., 2018). Table 1 provides an overview of the multi-level social determinants of mental health disorders, along with examples of factors.

Table 1

Social determinants of mental health disorders with examples of factors

List of determinants		Examples of operationalization of the factors[1]
Demographic	Proximal	Age, ethnicity, gender.
	Distant	Community diversity, population density, longevity, survival.
Economic	Proximal	Income, debt, assets, financial strain, relative deprivation, unemployment, food security.
	Distant	Economic recessions, economic inequality, macroeconomic policy.
Neighbourhood	Proximal	Safety and security, housing structure, overcrowding, recreation.
	Distant	Infrastructure, neighborhood deprivation, built environment, setting.
Environmental events	Proximal	Trauma, distress.
	Distant	Natural disasters, industrial disasters, war or conflict, climate change, forced migration.
Social/cultural	Proximal	Individual social capital, social participation, social support, education.
	Distant	Community social capital, social stability, cultural capital.

Notes. These examples are from Lund et al. (2018)

When it comes to how suicide has been studied, scholars have pointed to the methodological narrowness of approaches used. This is largely due to the primacy of quantitative methods (Fitzpatrick, 2015; Goldblatt et al., 2012; Goldney, 2002; Hjelmeland & Knizek, 2011; Kral et al., 2012; White et al., 2016; Wray et al., 2011). Two review articles substantiate this point. In a review of the top three international suicidology journals in a four-year period and in a review of the articles on suicide in the four top-tier sociology journals in a 19-year period, respectively, 97% and 98% of the articles were based on quantitative methods (Hjelmeland & Knizek, 2011; Wray et al., 2011). Furthermore, the qualitative component in 3% of the articles in the suicidology journals was frequently a small component of a larger quantitative study. The reliance on quantitative research methods means a focus on understanding the *who* and *what* (Hjelmeland & Knizek, 2011; White et al., 2016). Advances in data collection and statistical techniques have allowed for an increase in multilevel modeling compatible with theoretical underpinnings from sociology, anthropology, and suicidology (Knox et al., 2004; Wray et al., 2011). However, the overemphasis on quantitative methods, often through a biomedical paradigm, has been critiqued for placing too much emphasis on individual-level factors so that they can be managed (White et al., 2016). In turn, the limited use of qualitative research de-

signs means that our understanding of the *how* and *why*, along with the complexity brought by lived realities and contexts, are much more limited (Hjelmeland & Knizek, 2010, 2011; Wray et al., 2011). At first glance, the empirical evidence underlying arguments of methodological narrowness in the study of suicide appears strong. However, much of this evidence is based on assessments of what has been published in top-tier journals. Given the documented biases in favor of quantitative methods in top-tier journals (Hjelmeland & Knizek, 2011; White et al., 2016; Wray et al., 2011), questions arise about how suicide has been studied outside of these journals and the extent to which the study of suicide is methodologically as narrow as argued.

Methods

Our methodological approach to the literature review is based on the merging of two commonly used frameworks. First, we used the five-step scoping review methodological framework from Arksey et al. (2005) to guide the planning and implementation of the review. Second, we used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement as a guide for article identification, selection, and review (Page et al., 2021). In the remainder of the article, we refer to our team of authors conducting the review as the "reviewers" to avoid confusion with the authors of the articles included in the review.

Literature review focus identification

The first step of a scoping review is to identify the focus of the literature review. Given our interest in understanding how suicide has been studied and the bearings that research designs might have on our understanding of suicide, we developed the following four guiding questions with the social determinants of mental disorders as our underpinning conceptual framework: 1) Which research designs are most frequent in the study of suicide in agriculture, and which ones are least frequent? 2) Which proximal and distal factors have received the most attention in the literature, and which ones have received the least? 3) In what ways does the inclusion of social determinants of mental health disorders vary based on the research design? 4) What are the implications of the gaps identified in both research designs and social determinants studied in our understanding of death by suicide in agriculture?

Literature search

The second step of the scoping review process is the literature search, which includes developing and implementing the search strategy (Table 2). Between March and April 2022, we searched three electronic databases: PubMed, Scopus, and Web of Science. We selected these three databases to ensure a wide indexing of journals from health and social sciences. In particular, PubMed is considered an exhaustive database for health sciences, while Scopus and Web of Science provide a greater coverage of social sciences. We used a combination of nine keywords: suicid* & farm*, suicid* & agri*, suicid* & ranch*, intent* death & farm*, intent* death & agri*, intent* death & ranch*, self-inflict* & farm*, self-inflict* & agri*, self-inflict* & ranch*. We developed the list of keywords using existing literature reviews on topics connected to suicide and mental health in agriculture (Daghagh Yazd et al., 2019; Hagen, 2019; Reed, 2020). We limited our search to peer-reviewed articles written in English but imposed no limitation on the year of publication. The initial search of the three databases yielded 5,572 records, of which 3,319 were duplicates.

Table 2

Scoping review search criteria

Search categories	Search criteria
Type of study design	No limitation
Time scale	No limit
Geographical focus	Any country/country grouping
Language	English
Keywords	suicid* - intent* death - self-inflict* in combination with: farm* - ranch* - agri*

Study selection

The third step is the study selection process, which we conducted using the PRISMA statement (Page et al., 2021). As the study selection workflow in Figure 1 shows, we first screened the articles by reviewing the titles and abstracts. Then, for articles that meet the inclusion criteria, we conducted a second screen by reviewing the full article. We used the following inclusion criteria: 1) the article was published in a peer-reviewed journal, 2) the article was written in English, 3) the article was an empirical study, 4) the primary focus of the study was suicide, and 5) the primary population of focus was affiliated with the agricultural sector (i.e., farmers, farm workers, or family members of someone working in the agricultural sector). Given the scoping nature of our review, we had no inclusion/exclusion criteria connected to the study design, methods, and timeframe. A total of 2,253 articles were screened, with 2,119 removed after the review of the title/ab-

stract and two removed after the review of the full text. To ensure the review was as timely as possible, we added two articles that were published in the year of the searches, as it is unlikely that they would be indexed in the databases. The search process led to the identification of 25 literature reviews and 1 commentary/critique article. While these types of articles contribute to knowledge development, we elected not to include them in our review for two reasons: 1) most importantly, including the literature reviews would have inherently led to including the same article multiple times (as many of the empirical articles are included in literature reviews) with consequences on the accuracy of the representation of the empirical landscape and 2) to be in-line with the prevailing literature review approach in which reviews tend to be strictly focused on one type of article. Our scoping review, therefore, includes 108 articles; the list of articles can be found in Table 3.

Figure 1

Article review flow chart

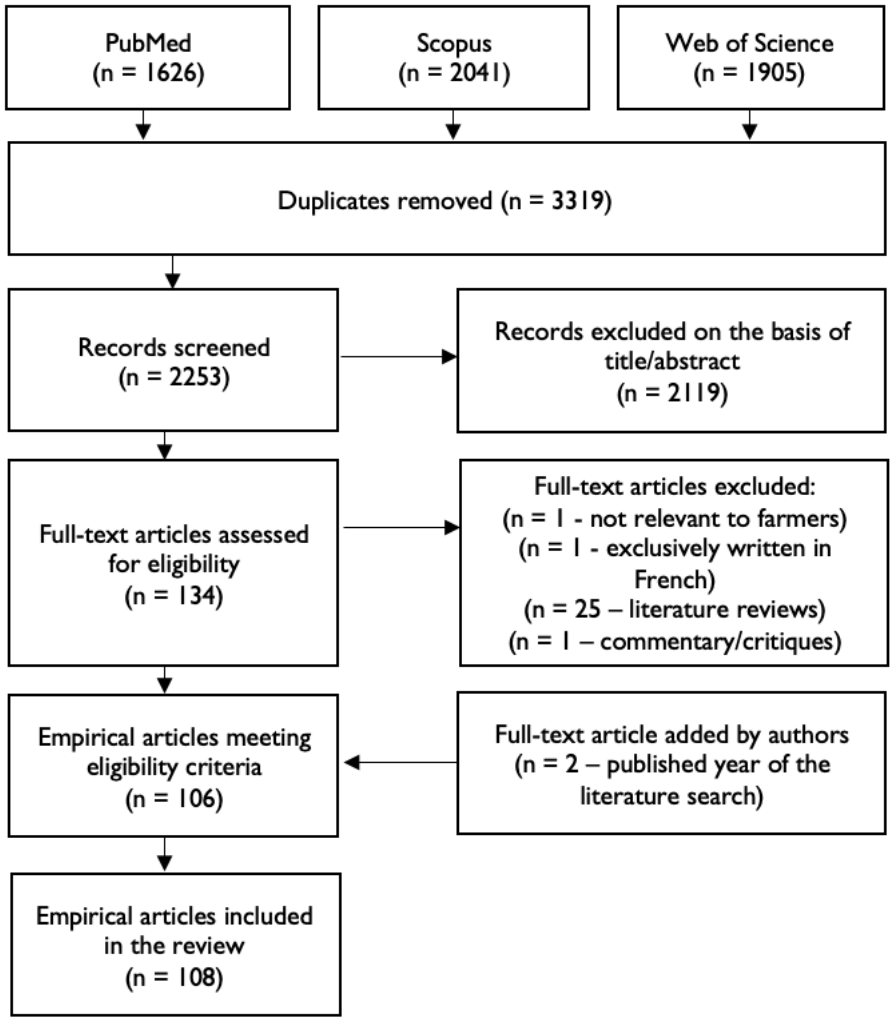


Table 3

List of articles included in the review

Article reference		
1. Alicandro et al., 2021	37. Kennedy et al., 2020	73. Stallones, 2006
2. Andersen et al., 2010	38. Kennedy et al., 2021	74. Stallones et al., 2013
3. Arif et al., 2021	39. Kennedy et al., 2021	75. Steck et al., 2020
4. Arnautovska et al., 2014	40. Kennedy & King, 2014	76. Sun et al., 2015
5. Arnautovska et al., 2016	41. Kim et al., 2014	77. Sutton et al., 2005
6. Beard et al., 2011	42. Kim et al., 2019	78. Swami et al., 2020
7. Beautrais, 2018	43. Kohlbeck et al., 2021	79. Szortyka et al., 2021
8. Behere et al., 2021	44. Kumar & Hashim, 2017	80. Tanaka et al., 2020
9. Behere et al., 2021	45. Kunde et al., 2018	81. Thakuria & Mazumder, 2017
10. Bhattacharyya et al., 2020	46. Lee et al., 2016	82. Tiesman et al., 2015
11. Bhise & Behere, 2016	47. Lyu et al., 2018	83. Viswanathan & Kumarasamy, 2019
12. Bjornestad et al., 2021	48. Malmberg et al., 1997	84. Wada et al., 2016
13. Booth et al., 2000	49. McPhedran & De Leo, 2013	85. Weichelt et al., 2021
14. Bossard et al., 2016	50. Meltzer et al., 2008	86. Yoon et al., 2019
15. Bower & Emerson, 2021	51. Meyer et al., 2010	87. Zhao et al., 2019
16. Browning et al., 2008	52. Miller & Rudolphi, 2022	88. Zhao et al., 2021
17. Brumby et al., 2011	53. Miller & Burns, 2008	89. Krawczyk et al., 2014
18. Bryant & Garnham et al., 2015	54. Nishimura et al., 2004	90. Badami, 2014
19. Chowdhury et al., 2007	55. Oh et al., 2021	91. Banik, 2017
20. Fullerton et al., 1995	56. Page & Fragar, 2002	92. Behere & Behere, 2008
21. Gallagher et al., 2008	57. Pandey et al., 2019	93. Dongre & Deshmukh, 2012
22. Goldcamp et al., 2004	58. Penttinen, 2001	94. Ebewore, 2020
23. Gonzaga et al., 2021	59. Perceval et al., 2017	95. Gutierrez et al., 2020
24. Guiney, 2012	60. Perceval et al., 2018	96. Gutierrez et al., 2015
25. Gunderson et al., 1993	61. Perceval et al., 2019	97. Kannuri, 2021
26. Guseva Canu I et al., 2021	62. Peterson et al., 2020	98. Kim, 2021
27. Hanigan et al., 2012	63. Phalp et al., 2021	99. Kumar, 2006
28. Hawkins et al., 2020	64. Pickett et al., 1998	100. Lavender et al., 2016
29. Hawton et al., 1998	65. Racette et al., 2007	101. Mäkinen & Stickley, 2006
30. Hawton et al., 1999	66. Richardson et al., 2020	102. Münster, 2015
31. Hovey & Magaña, 2003	67. Ringgenberg et al., 2018	103. Nair, 2021
32. Inskip et al., 1996	68. Roberts et al., 2013	104. Singh et al., 2019
33. Joo & Roh, 2016	69. San Too & Spittal, 2020	105. Truchot & Andela, 2018
34. Judd et al., 2006	70. Simkin et al., 2003	106. Vasavi, 2009
35. Kanamori & Kondo, 2020	71. Skegg et al., 2010	107. Chinnasamy et al., 2019
36. Kavalidou et al., 2015	72. Spennemann et al., 2019	108. Den Besten et al., 2016

Note. The bibliographic details of the reviewed articles can be found in the references, where they are marked by asterisks.

Charting of the data

The fourth step is the charting of data, which is akin to the coding process in qualitative research methods. We developed a data extraction tool to capture information connected to the research design and the social determinants of mental disorders framework (Lund et al., 2018). For the research design, we recorded the following information: 1) goal of the study, 2) data source (i.e., primary/secondary, and name of dataset, if provided), 3) data type (i.e., qualitative/quantitative and mode of data collection), 4) geographical focus of the study, 5) year of publication, 6) population of focus, 7) sample size and unit of analysis, and 8) analytical approach. Early on, our data extraction tool also included the disciplinary grounding of the author(s). However, we quickly realized the complexity of reliably obtaining that information. The disciplinary background of authors was not always obvious based on the author's information and/or article, and interdisciplinary teams of authors and/or publication in interdisciplinary journals also seemed common. For the social determinants of mental health disorders framework, we recorded if the studies included: 1) the factors from the framework (i.e., demographic, economic, neighborhood, environmental events, social and cultural domains) and 2) whether each of the included factors, which are known to exert influence on mental health, were proximal (i.e., individual-level factors that are directly connected to an individual's identity and/or aspects of their immediate environment), and/or distal (i.e. structural level factors over which individuals generally have little to no agency). See Table 1 for the list of social determinants of mental health disorders with examples of factors. In addition, we recorded study variables not explicitly referenced in the framework for later team discussions and categorization. Last, while it is not uncommon to assess the quality of studies, we did not extract relevant information to conduct that assessment. This choice is in line with the scoping review approach, which is about understanding how studies have been conducted over the quality of the empirical results (Arksey & O'Malley, 2005). Two of the reviewers extracted the review information for the 108 articles. To ensure a consistent approach to data extraction, the two reviewers first extracted the data from the same five articles. These articles were selected to be reflective of a range of research designs based on the information provided in the abstract. The comparison of the data extraction across the two reviewers for these five articles revealed a high level of agreement in that the same factors in the social determinants of mental health disorders framework were identified in the articles by both reviewers. Additionally, the two reviewers agreed on the research design components. After determining that the data extraction approach was similar among the two reviewers, they then split the remaining articles. When unsure about data extraction for an article, the reviewers flagged that ar-

ticle for discussion during team meetings. Decisions were made by consensus among the three reviewers.

Following the extraction of the information from the articles, we proceeded to dataset clean-up and recoding (see summary of approach in Table 4). We used the year of publication over the year of data collection, given that the latter tended not to be reliably reported.

Table 4

Overview of approach to recode the research design's variables

Research designs variables	Recoding approach
Geographical focus	Recoded at the country-level or at multi-country-level
Age of study	Computed using year of publication
Study goal(s)	Developed categories using an inductive approach
Population of focus	
Sample type	
Data source	Developed categories using a deductive approach based on common categories relevant to each variable.
Data type	
Data analysis approach	

The geographical focus variable was recoded so that regional geographical units were scaled up to the country and continent levels. Studies reporting more than one country were categorized as "more than one country." Four variables produced a wide range of answers (i.e., study goals, population of focus, unit of analysis for the sample size, and analytical approach). We used an inductive approach to create categories to summarize the answers for these variables except for the categorization of the analytical approach for the quantitative studies, whereas we used a deductive approach to categorize these answers (i.e., univariate, bivariate, multivariate analysis). Last, for the variables connected to the social determinants of mental disorders, the reviewers discussed the categorization of factors that were not specifically called out in the Lund et al. (2018) framework and factors that could be categorized as more than one. For those factors mentioned in articles but not specifically referenced in the model, we assessed the fit of each using the definitions for each factor and found that most of these factors were specific to agriculture (e.g., farm type and size, pesticides). In addition, four sets of factors could not be categorized under one of the original five social determinants factors (i.e., mechanisms of injury, mood/personality, physical/mental health status, substance use), but we note that these are all key variables in the theorization of suicide (Baldessarini, 2020;

Kohlbeck et al., 2022). For the factors that could be categorized as more than one factor, we categorized these factors based on how the authors of the reviewed studies operationalized these factors and used them in their analysis. One common example was "pesticide use," which we categorized as an economic factor when it was a proxy for lack of autonomy/control or as a neighborhood factor when the authors studied the links between the toxicity of pesticides and suicide (e.g., Chiswell (2022); Merriott (2016)). Another common example was "marital status," which we categorized as a demographic factor when the authors used that variable as a descriptive and/or control variable or as a social factor when the authors assessed the role of social supports in suicide (e.g., Arif (2021); Lavender (2016)).

Collating and summarizing the data

The fifth and final step of the scoping review is the collating and summarizing of the data. Once we completed the charting of the data, we exported the dataset to the statistical analysis software STATA IC (StataCorp, College Station, TX). While we did not conduct a complex analysis of the dataset, the use of the statistical analysis software greatly eased the process. We first conducted univariate analysis to obtain the frequencies of the research designs and social determinants factors in response to the first and second research questions. Then, to respond to the third question, we conducted a bivariate analysis to obtain the frequencies from the cross-tabulation of social determinants factors (e.g., demographic, economic, distal, etc.) and components of the study design (e.g., study goals, data source, etc.). We removed categories present in five or fewer studies to avoid giving disproportional weight to very small categories (i.e., "evaluate suicide prevention methods or instruments" and "describe the consequences of suicide" in study goals, "agricultural workers" in population focus, and "case studies" in analytical approach). We elected not to statistically test differences between the research design and social determinants factors. The sample size in some of the crosstabs did not meet the sample size threshold of five (commonly used to determine statistical testing strategies). Furthermore, our intention with the bivariate analysis was to develop a general understanding of the research design landscape and to identify general patterns. As such, we worried that the statistical testing could provide a false sense of precision. Once we completed the data analysis, we developed tables to present the findings from the univariate analysis. We elected to develop a visual representation to summarize the key findings of the bivariate analysis. Reported in Figure 4 are the categories with the highest proportion of articles along with the second highest category when there is less than

a five percentage point (5%) difference between the top two categories. The goal of this visual representation over a tabular presentation was to simplify the interpretation of what would otherwise be a complex and large table. We report the proportions in the text, and the table with full details is available upon request.

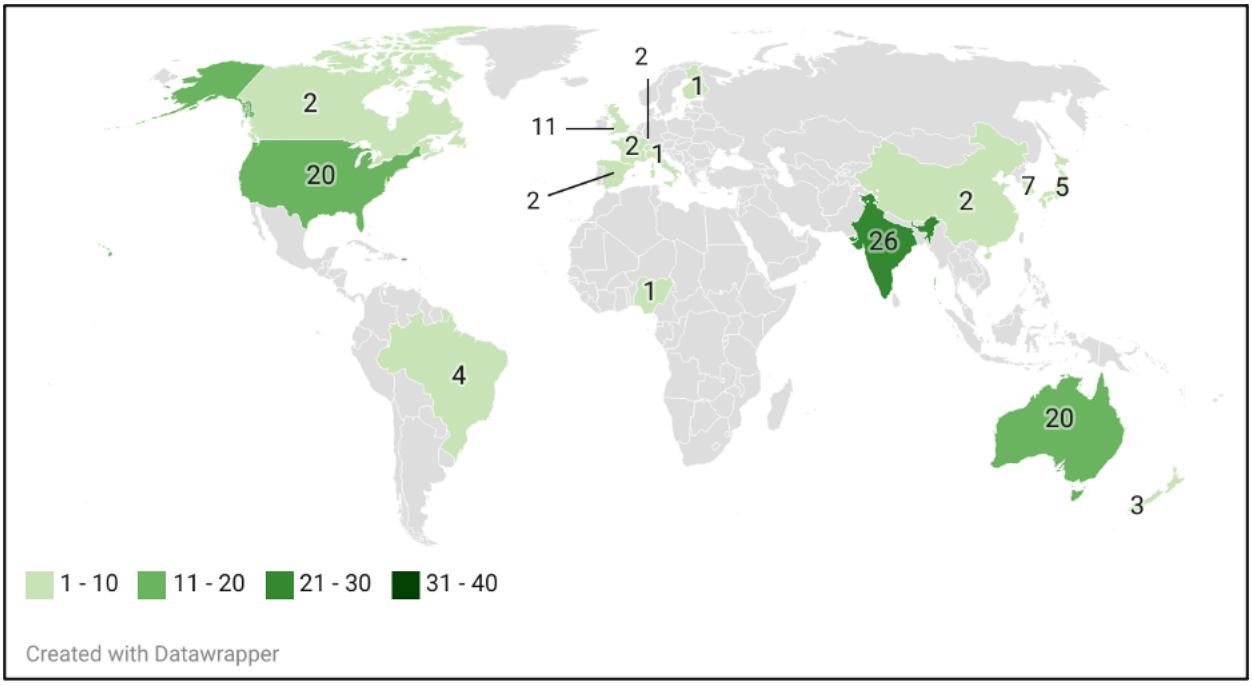
Findings

Geographical focus and temporality of studies

Of the 108 articles, the greatest proportion of studies on suicide among the agricultural population is from Asian countries (36% of the identified studies, with two thirds of these studies focused on India), while the second greatest proportion of studies are from Oceanian and North American countries (respectively 21% and 20% of the studies with most coming from Australia and the United States). The smallest proportion of studies come from African (0.9% of studies) and South American (4% of studies) countries. See Figure 2 for a map showing the geographic origin of studies.

Figure 2

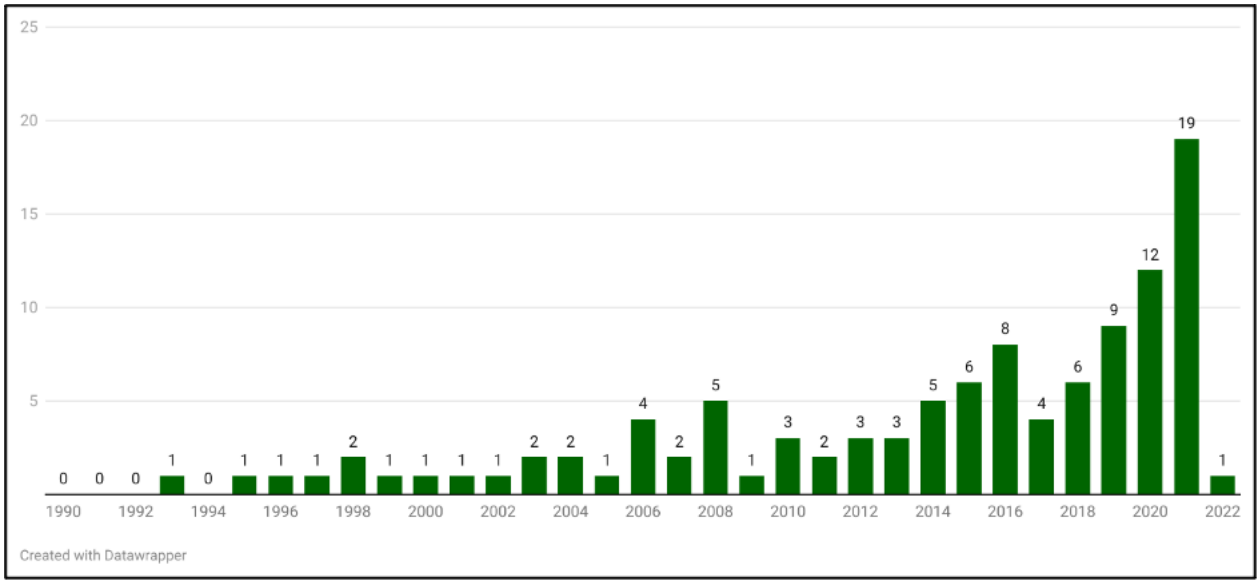
Studies by geographic focus



In terms of the temporality of the studies, the first study we identified was from 1993 (Figure 3). After about two decades of relatively limited activity (0 to 2 studies per year), there has been a noticeable increase in the number of publications starting around 2008. Indeed, about 80% of the identified studies were published after 2008.

Figure 3

Number of studies per year of publication.



Research designs

The categorization of the research designs reveals a pattern in how suicide in agriculture is studied, with about 60% of all identified studies resembling a similar approach (Table 5). The archetype of study designs is as follows. Most frequently, studies that intended to identify factors and pathways to suicide (this was the focus of 57% of studies, followed by 50% of studies describing the burden of farmer suicide, including comparison with other population groups), were focused on farmers (67% of studies compared to 5% strictly focused on agricultural workers and 24% including both farmers and agricultural workers), were based on secondary data (74% of studies), used quantitative data (85% of articles), were based on suicide records (56% of studies), and included quantitative bivariate and/or multivariate analysis (77% of studies). Looking specifically at the studies based on qualitative data (20% of studies), these studies were most frequently based on data from interviews/focus groups (11%), while one article was described as a case study. The qualitative data was most often analyzed using thematic analysis (62%), while other approaches were found in 33% of studies (i.e., one study with each of the following designs: interpretative methodology, pile sorting, narrative analysis, content analysis).

Table 5

Summary of research designs (n= 108)

Research design components	% (unless otherwise noted)
Study goals*	
Identify factors and pathways to suicide including specific variables	57.4
Describe the burden of farmer suicide including comparison with other population groups	50.0
Evaluate suicide prevention methods or instruments	2.8
Describe the consequences of suicide on the descendants of the victim	1.9
Data source*	
Secondary	73.8
Primary	29.0
Data type*	
Quantitative	85.1
Qualitative	19.6
Population focus*	
Farmers	66.7
Comparison of agricultural population with population in other occupational sectors	28.7
Farmers and agricultural workers	24.1
Family members of suicide victims	6.5
Agricultural workers	4.6
Sample type*	
Suicide records	56.1
Surveyed individuals	15.0
Interview/focus groups	11.2
Other**	12.2
Secondary population data	9.4
Analytical approach*	
Quantitative: Univariate analysis only	7.7
Quantitative: Bivariate analysis	63.7
Quantitative: Multivariate analysis	61.5
Qualitative: Thematic analysis	61.9
Qualitative approach: Other***	33.3
Qualitative: Case study	4.8

Note. *Can add to more than 100% as several categories could apply to the same study. **Other includes: rainfall/ crop data, gross domestic product, case study. ***Other includes: content analysis, narrative analysis, sociological commentary.

Coverage of social determinants of mental health disorders

Turning to the coverage of the social determinants of mental health disorders across identified studies, at least two thirds of all studies (regardless of the inclusion of proximal and distal levels of analysis) included demographic (82% of studies) and economic (66%) determinants factors and less than half of the studies included measures of social/cultural (48%), neighborhood (44%), and environmental (41%) determinants factors (Table 6). Looking at the level of analysis of the social determinants included in the study, almost all studies (98%) included a proximal factor (i.e., aspects of life with which individuals interact), while about two thirds of the studies (68%) included a distal factor (i.e., structural arrangements and trends in society over which individuals have no direct interactions).

Digging deeper into the social determinants across the two levels of analysis, studies most frequently included proximal demographic factors (82% of studies with most emphasis on gender/sex and age), followed by proximal economic factors (64% of studies with most emphasis on income, debt, and financial strains), and equally proximal social/cultural factors (44% of studies with most emphasis on measures connected to education) and distal neighborhood factors (44% of studies with most emphasis on measures connected to the agricultural setting, such as pesticide use and exposure). The least often included were proximal neighborhood factors (3% of studies with most common factors connected to workplace safety practices and knowledge), distal demographic (9% of studies with most common measures connected to population density), and distal social/cultural factors (13% of studies with emphasis on cultural factors such as concepts of masculinity, individualism, nationality, and religion). Last, our review revealed several measures that were not explicitly included in the operationalization of the model by Lund et al. (2018). Some of these measures are likely important to understand suicide in agriculture (i.e., occupation and farm type/role in proximal economic factors). Other measures are likely relevant to the study of suicide regardless of the occupation (i.e., marital status, sexuality, and military service in proximal demographic factors).

Table 6

Coverage of social determinants factors in empirical studies (n=108)

	All (n=108)	Proximal factors (n=106)			Distal factors (n=73)		
	% and # that included	% and # that included	Factors (with number of studies) and examples of operationalization	Citations*	% and # that included	Factors (with number of studies) and examples of operationalization	Citations*
Demographic	82.4% 89 articles	81.5% 88 articles	gender/sex (82); age (74); marital status (29)**; ethnicity/race (19); sexuality (2)**; military service (1)**	1-88	9.3% 10 articles	population density (8); community diversity (1): demographic and socioeconomic changes in farming communities; life expectancy/longevity (1); survival (0)	10, 31, 35, 51-54, 61, 66, 89
Economic	65.7% 71 articles	63.9% 69 articles	income (29); debt (20); financial strain (20): sources of credit, credit availability, job loss event; unemployment (13); occupation (7)**; assets (5); farm type/role (6)**; relative deprivation (2): position relative to poverty line; food security (0)	2, 3, 6-8, 10-15, 20, 21, 23, 26, 28, 30, 31, 33, 34, 37-45, 47-49, 52, 54-57, 60, 62-64, 68, 69, 73, 78-83, 86, 89-106	20.4% 22 articles	macroeconomic environment (17): market fluctuations, farm policy, neoliberal trade reforms, grain drain; economic recessions (6): low economic growth rate; economic inequality (2): rural poverty, class struggles, political callousness	10, 41, 44, 54, 59, 63, 68, 69, 78, 84, 86, 90-93, 98, 101-106
Neighborhood	44.4% 48 articles	2.8% 3 articles	workplace safety practices and knowledge (2); recreation (1); housing structure (0); overcrowding (0)	22,55,63	43.5% 47 articles	agricultural setting (35): pesticide use and exposure; infrastructure (8): social infrastructure access (i.e. medical care, childcare), transportation and road quality, social policy; neighborhood deprivation (3): lack of sources of support and resources to cope with life stressors; built environment (2): structural features of a neighborhood (electricity, drinking water)	3-6, 9, 10, 16, 20, 22, 25-27, 29-31, 33-37, 39, 42, 44, 47, 48, 51, 52, 55, 59, 60, 64, 66, 74, 76, 78, 79, 82, 83, 87-90, 93, 95, 96, 103, 105
Environmental	40.7% 44 articles	25.9% 28 articles	distress (21): work dissatisfaction, high stress work experiences; trauma (8): exposure to recent suicide of family or friend	10,11,15,31,34,37,39 ,40,43,48,51,52,54,5 5,57,60,67,72,77,81, 82,90,93,97,99,100,1 02,104	18.5% 20 articles	climate change (18): reduced rainfall, extended periods of drought, weather unpredictability; natural disasters (3): flooding, drought; forced migration (0); war or conflict (0)	9, 10, 24, 27, 37, 45, 59, 66, 78, 83, 91, 93-96, 99, 105-108
Social/Cultural	48.2% 52 articles	43.5% 47 articles	education (29); social support (8): proximity of family to work, relationship problems; social participation (7): membership in groups or clubs, emotional isolation; individual social capital (1): coping/resilience	1, 6, 7, 10-12, 16, 23, 26, 28, 31, 33, 36, 37, 39, 42-45, 48, 49, 52, 54, 55, 59-61, 64, 67, 68, 72, 74-79, 81, 82, 89, 90, 94, 97, 98, 100, 103, 105	13.0% 14 articles	cultural (11): concepts of masculinity and individualism, nationality, religion; social stability (3): local suicide rates, distance from family after migrating to new place; community social capital (1): religious participation, community connections	10, 11, 13, 26, 30, 31, 34, 45, 61, 79, 84, 90, 97, 102, 106

Note. *Article references can be found in Table 3; **Factors that fit into the framework category but were not explicitly noted in the Lund model

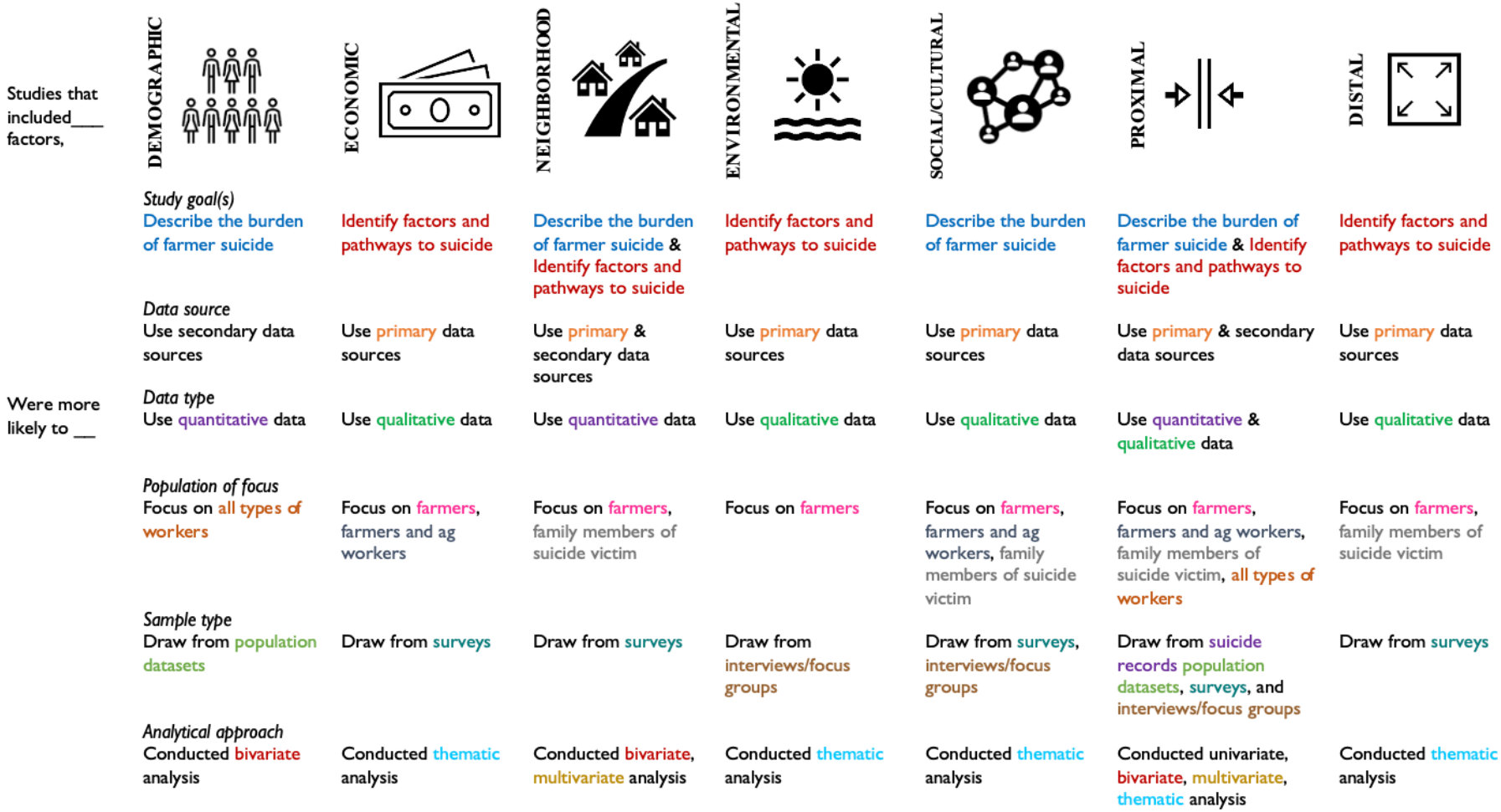
Variations in research designs used across social determinants

We now turn our attention to an examination of the patterns in research designs used across the social determinant factors studied and the levels of analysis. Doing so enables the identification of gaps in research designs and social determinants studied (Figure 4).

First, in looking at the five social determinants, studies that included demographic and social/cultural factors were most likely to have the primary goal of describing the burden of farmer suicide (89% and 54% of studies, respectively). Studies that included economic and environmental factors primarily had the goal of identifying factors and pathways to suicide (73% and 53%). Meanwhile, studies that included neighborhood factors had the double goal of describing the burden of farmer suicide (44%) and identifying factors and pathways to suicide (48%). Primary data sources were most frequently used for studies focusing on economic (84%), social/cultural (65%), environmental (61%), or neighborhood (48%) factors, while the studies with a primary focus on demographic factors (86%) most frequently used secondary data sources. Related to data type, studies focusing on demographic (87%) and neighborhood (47%) factors were quantitative in nature, while those focusing on economic (90%), environmental (76%), and social/cultural (57%) factors favored qualitative data. The population of focus also varied by study focus; studies that included any of the factors, except for demographic, tended to focus on farmers (between 44 and 68% of studies). Studies that included demographic factors most frequently examined suicide across occupational sectors (90%). Studies including a focus on economic, neighborhood, and social/cultural factors also included other populations of focus: farmers and farm workers in studies with economic (65%) and social/cultural (46%) factors, family members of suicide victims in studies with neighborhood and social/cultural factors (43% for the two factors). In terms of variations in data sources, studies that included demographic factors most likely used secondary population data (100%), while studies looking at economic (93%) and neighborhood (73%) factors most likely used surveys as their main data source. Studies examining environmental factors were most likely to be drawn from interviews and focus groups (72%). Studies examining social/cultural factors used a mix of surveyed and interviewed individuals (67% and 64%, respectively). Finally, in terms of analytical approach, studies that included demographic factors tended to use a bivariate analysis approach (95% of these studies), while studies including economic (92%), environmental (85%), and social/cultural (77%) factors tended to use a thematic analysis approach. Last, studies including neighborhood factors used a mix of bivariate (50%) and multivariate (55%) analysis approaches.

Figure 4

Research designs relative to social determinants factors and levels of analysis



Turning to the level of analysis, we find more variation in research designs for proximal-level factors compared to distal-level factors. This is not surprising, given proximal level factors were present in a larger number of studies. Studies including proximal-level factors were most likely to include the dual goal of describing the burden of suicide (100%) and identifying factors and pathways to suicide (97%). Studies including distal-level factors had the goal of identifying factors and pathways to suicide (76%). While studies with proximal and distal-level factors both relied more on primary data sources (100% and 77% of studies), a larger proportion of studies with proximal-level factors also relied on secondary data (98%). Studies with distal-level factors were primarily qualitative in nature (76%) and most often focused on farmers (74%), while studies with proximal-level factors were equally quantitative and qualitative in nature (respectively 98% and 100%) and included four populations of focus: farmers (97%), farmers and farm workers (100%), family members of suicide victim (100%), and workers across occupational sectors (100%). Reflecting the research design, studies including proximal-level factors drew on suicide records, secondary population data, surveys, and interviews/focus groups (98% for suicide records and 100% for the other three sample types), and all were most likely to include univariate (100%) bivariate (98%), multivariate (98%), and thematic analysis (100%). Meanwhile, studies with distal-level factors primarily drew on surveys (93%) and were more likely to conduct thematic analysis (85%).

Discussion

The goal of our scoping review was to understand which research designs have been used to study suicide in agriculture, which factors have been emphasized, and the implications of the gaps identified in our understanding of suicide in agriculture. As we summarize our key findings, we point to their implications as they pertain to our understanding of suicide in agriculture, as well as how they pertain to how suicide has been studied. We also leverage the limitations of our scoping review to reflect on what overtly positivist approaches to identifying and summarizing bodies of literature miss and obscure.

The first question guiding our scoping review was intended to assess the prevalent research designs to study suicide in agriculture. We found an archetype approach with a focus on identifying factors and pathways to suicide, principally among farm owners/operators, using quantitative secondary data. These findings are not surprising. A majority of the data used in these studies is in the form of death records or population-level surveillance. These contain only basic information about the decedent and the circum-

stances of the death (Ikeda et al., 2014). The limited focus on agricultural workers might be explained by their greater level of vulnerability and invisibility compared to farm owners/operators (Bue et al., 2022; Hurst et al., 2007; Mize et al., 2010) The finding that studies primarily use quantitative data with the goal of identifying specific variables, rather than explaining mechanisms at play, echo previous assessments in the general field of suicide (Hjelmeland & Knizek, 2011; Wray et al., 2011). Meanwhile, our findings differ from previous assessments in the broader suicide literature in one important way. While these assessments found that almost all studies of suicide were based on quantitative data, we found that almost 20% of the studies focused on the agriculture population made use of qualitative data, albeit with limitations in the richness of such data. This is because, while the qualitative researchers' toolkit is rich, most of the studies using qualitative data were based on interviews and focus groups conducted at one point in time, often devoid of information about the context. As such, our findings give weight to our supposition above, which is that assessments of a field of study solely focused on top-tier journals do not adequately capture the diversity of methodological approaches.

The second guiding question of our scoping review was intended to assess which social determinants of mental health disorders have received the most attention and which have received less. We found that most often, studies focused on proximal-level factors, predominantly demographic (principally gender/sex and age) and economic factors (such as debt and income). The factors that received less attention were the distal demographic factors, distal social/cultural factors, and proximal neighborhood factors. Again, given the reliance of the studies on surveillance and mortality data, this finding is not surprising. Nevertheless, studies relying on these types of data can only go so far in an exploration of factors contributing to suicide, as the data included in these records are relatively limited (Crosby et al., 2016). The lower proportion of studies incorporating distal factors reveals a gap in the literature. The theoretical corpus from sociology, anthropology, public health, and suicidology has pointed to the importance of considering suicide within the larger social, economic, cultural, political, and natural environments within which it occurs (Berman et al., 2021; Mueller et al., 2021; Daniel Münster & Broz, 2015; Nettleton, 2021; Singer et al., 2020; Sterling & Platt, 2022). For example, risk for suicide has been linked to community diversity and population density (distal demographic factors), inadequate access to basic needs like safety and security (proximal neighborhood factors), and lower levels of social cohesion and stability (distal sociocultural factors) (Bertolote et al., 2005; Gallagher et al., 1994; Howard et al., 2022; Mueller et al., 2021; Shneidman, 1993; Stark et al., 2007; Wray et al., 2011). Integrating distal and proximal factors in the same study does not necessarily require primary data collection.

There is a wealth of publicly available data that researchers can incorporate in both qualitative and quantitative studies, including, but not limited to, population and agriculture censuses, economic surveys, or community assessments. Nonetheless, the practices around data collection and anonymity of surveillance and mortality data do mean that it is often not possible to link suicide data to other datasets. This limitation likely explains the limited use of qualitative, in-depth case studies and quantitative multilevel modeling. The extent to which the existing body of knowledge is reliable should, however, be a concern. This is particularly the case for findings based on multivariate modeling, given that the likelihood of model misspecification increases when key variables are missing.

The focus on particular social determinants likely varies across countries. Indeed, the intent and type of data collected about populations are shaped by a country's social, cultural, economic, and political contexts (Choi, 2012). Particularly relevant to the study of suicide, in particular for anthropologists, is the consideration of suicide and how, for example, it intersects with religious beliefs, societal stigma, and even the meaning of death (Guzmán et al., 2019; Schomerus et al., 2015; Staples & Widger, 2012). While we were not able to formally compare social determinants studied across countries (ironically due to data limitations), India and Australia provide two examples of geographical variations in the study of suicide in agriculture. Reading through the articles, we noticed similar patterns to those Ramadas and Kuttichira (2017) previously identified. Studies about the agricultural sector in India were more likely to describe suicide as a political act, highlighting the plight of small-scale farmers with an emphasis on economic measures, including economic and agricultural policies and economic inequality (Bhattacharyya, 2020; Münster, 2015). Meanwhile, studies about the agricultural sector in Australia were more likely to focus on the impact of extreme weather events (Hanigan, 2012; Kunde, 2018; Perceval et al., 2019). These two examples do not infer that these particular factors disproportionately affect some countries over others. Rather, they point to the importance of considering the larger social and cultural contexts of studies and of embracing knowledge creation from a broad range of countries. This is because assessments focused on top-tier journals, which are most often published in English, place the scholarship from countries with less support for research and/or non-English language scholarship at a disadvantage. We reflect below on the limitations of our own review, given our focus on the English-language literature.

The third question of our scoping review was intended to assess how the inclusion of social determinants of mental health disorders varies based on the research design. We

identified two key patterns. First, while quantitative studies were disproportionately represented in the study of suicide in agriculture overall, only two of the five social determinants (demographic and neighborhood) were primarily studied using quantitative data. Meanwhile, studies including proximal-level data were equally based on qualitative and quantitative data, while studies including distal-level data were primarily qualitative. Still, and as noted above, the qualitative data were primarily from interviews and focus groups at one point in time. Equally, analytical diversity was limited as most studies were based on a thematic analysis. Data limitations noted above and limitations connected to journal article formats likely explain this finding. Second, a closer look at the type of qualitative data used to study economic, neighborhood, and distal-level social determinants factors revealed that most often, these studies relied on insights from surveys, yet the analytical approach most often used was a thematic analysis. This finding might be explained by the use of open-ended questions in the surveys, which likely yield narrow qualitative insights. The two patterns we identified, therefore, bring up further concerns about the breadth, depth, and reliability of the body of knowledge.

Limitations and reflections

We now discuss four limitations of our scoping review approach that have implications for our findings. This discussion of the limitations provides an opportunity to reflect on the knowledge that is seen and the knowledge that is missed or obscured through the prevalent health sciences model of conducting literature reviews. First, the focus of our review on material written in English obscures the development of a full understanding of how suicide in agriculture has been studied. Looking at studies by geographic focus, we note a dearth of articles from areas where a sizable share of the population is involved in agriculture (e.g., African and Central/South American countries). This raises questions about what scholarship we missed and what variations in research designs and areas of focus we did not capture because of our narrow linguistic focus. However, because English has become a prevailing language within the scientific community (Mueller et al., 2021; Popova et al., 2017), the dearth of articles from a large number of countries brings up questions about whether suicide in agriculture might not have been studied in some countries due to lack of existing data, lack of research funding, and/or social stigma around suicide. From an anthropological standpoint, it also brings up questions about variations in the meaning of suicide across cultures (Daniel Münster & Broz, 2015; Staples & Widger, 2012).

Second, our search process was limited to searching electronic databases, which favor the indexing of scholarly journals. This is a common approach to conducting a literature review, but this means that we did not adequately capture books and book chapters. Rich and dense qualitative and mixed-methods studies, which are well suited to speak to the gaps we identified, do not lend themselves well to the limiting journal article format. Indeed, cultural anthropologists and qualitative sociologists have a long tradition of favoring books. Therefore, our finding on the omnipresence of quantitative methods in the study of suicide, which echoes the finding of assessment from the broader body of work on suicide needs to be tempered (Hjelmeland & Knizek, 2011; Wray et al., 2011). When reflecting on what we might have missed in our scoping review, we thought of books we had previously read, and that would have likely met our review inclusion criteria. *Troubled fields: Men, emotions, and the crisis in American farming* by Ramírez-Ferrero (2005) is one example. In hindsight, we might have been able to broaden our approach within the confines of our existing search framework by selecting book reviews as a search criterion. The idea is not that we would have used the content of these book reviews in our assessment. Rather, these book reviews would have helped us identify books to include in our review. From an operationalization standpoint, the inclusion of books would likely require that the approach to charting the information be revised.

Third, our choice of keywords solely focused on suicide and adjacent words was modeled on previous literature reviews on the topic. This narrow keyword selection means that we likely side-stepped important qualitative work, including work published in books. Reflecting the inductive approach of letting the fieldwork guide the research, some scholars might not have started their fieldwork with the intention of studying suicide. Instead, the topic might have emerged during fieldwork. Two ethnographies that speak to this point are *Debt and dispossession: Farm loss in America's heartland* by Dudley (2000) and *Tobacco capitalism: growers, migrant workers, and the changing face of a global industry* by Benson (2012). As such, even if the treatment of suicide might not have been extensive enough to raise to the level of keyword, the insights into suicide in these books still provide important context and nuances. How to identify and incorporate this work is not straightforward. Perhaps the simplest yet time-intensive approach would have involved using the same keywords but searching the body of the text to select the articles instead of just focusing on the title and abstract. Another approach includes broadening the keywords we used to speak to illbeing in agriculture more broadly.[1]

[1] We thank one of the reviewers. Their comment on the different nature of anthropological approaches means that important insights emerged during the field work but might not raise to the level of keywords.

Fourth, we elected not to assess the quality of the studies. This choice was in line with the scoping review approach from Arksey and O'Malley (2005), which is focused on research design over study quality. We also felt that our team did not have the methodological expertise to adequately assess the quality of articles based on a wide range of study designs. Nevertheless, through the process of charting the information, we noted wide variations in the quality of the published articles, and some of these variations appeared to be based on disciplinary norms. Some articles clearly explained what and how the study was conducted, while others provided little details (which made it hard to chart the information). For example, our interdisciplinary team had several discussions around "what counts" as "adequate" methods and study-write up for a public health study vs. a social science study. In some instances, the data analysis approach did not appear adequate for the data available or appeared to include problematic statistical analytical decisions. Furthermore, we noted wide variations in the breadth and depth of the literature review section, which can, in part, be explained by disciplinary and journal guidelines differences. Some articles clearly built on the previous literature, while others seemed to disregard it. Our reflections raise questions about the rigor of the peer-review process in some journals, along with the lack of innovation in the study of suicide in agriculture. Speaking to the second point, the editors of a recent special issue on mental health in agriculture in *Sociologia Ruralis* called for the need to move beyond the simple identification of the problem to understand the underlying causes (Rose et al., 2023). The findings of our scoping review affirm the importance of their call. Last, our reflections bring up questions about studies from social scientists, including anthropologists, that do not get included in literature reviews because these studies did not fit the mold. Our suggestions to move past the limitations we noted should help broaden what knowledge is included in future reviews.

Conclusion

As countries around the world have increased their efforts to reduce suicide among the agricultural population, our understanding of the reach and effectiveness of these interventions is relatively limited. Key to developing and refining interventions is an understanding of why and how suicide in agriculture occurs, who is impacted, and what factors are at play. Several literature reviews have provided important syntheses of the existing body of knowledge (Freire & Koifman, 2013; Kennedy et al., 2014; Klingelschmidt, 2018; Reed, 2020). However, largely missing from this work of synthesis is an understanding of the processes by which this knowledge has been generated and, secondarily,

what types of knowledge have been included and, importantly, which types are obscured. This is a noteworthy research gap given that methodological approaches have bearings on the findings. Our review of 108 English-language articles assessed prevalent research designs along with social determinants of mental health disorders of focus. We overall find that the prevailing approach to studying suicide in agriculture is methodologically narrow, overplays a limited set of individual-level factors, and underplays structural-level factors. In line with previous critiques of agricultural mental health interventions (DeLind, 1986; Heaberlin & Shattuck, 2023; Inwood et al., 2019; Price, 2012), our review further points to the inadequacy of existing interventions given that the existing body of knowledge has not adequately incorporated theoretically important drivers of suicide. The review further points to ways some sources and types of knowledge are missed, including from anthropologists.

We now leverage our findings to propose three avenues for future research so that mental health interventions in agriculture can be adjusted. While researchers have a central role to play in engaging in this agenda, including in response to Münster's (2015) invitation for anthropologists to work on suicide, the onus for change is not on researchers alone[2]. It is also on those who fund the research and on those who use the research to embrace the diversity of approaches and knowledge offered by all disciplines. Indeed, and as we have noted at several points in the article, including below, rural social scientists, including anthropologists, have been working on these topics, engaging in theories and using methodological designs that yield rich and nuanced insights for decades.

The first avenue for future research is connected to the goals of existing studies. Most studies were intended to describe the prevalence of suicide in agriculture and to identify factors preceding suicide with limited consideration of the larger context in which suicide is occurring. As such, a much-needed line of research is one that moves beyond the "what" and "how" of suicide to explore the "why." This line of research echoes recent calls from colleagues writing about the broader field of suicidology (Hjelmeland & Knizek, 2011; White et al., 2016) and colleagues writing about the field of mental health in agriculture (Rose et al., 2023). Anthropologists are extremely well-positioned to answer "why" questions. Furthermore, given the extensive body of work on agrarian change and farm persistence, cultural anthropologists, rural sociologists, as well as human geographers are well-positioned to make critical contributions (see, for example, Calus et al., 2010; Dudley, 2000; Moran et al., 1993; Reinhardt et al., 1989; Schulman et al., 1994). Meanwhile, suicidologists are needed to contribute their interdisciplinary exper-

[2] We thank one of our reviewers for suggesting the onus for change.

tise in the study of suicide as a health outcome. Also needed is a line of research to understand "what works" in the prevention of suicide. Indeed, our scoping review confirmed colleagues' assessments that there is a dearth of research to evaluate mental health and suicide interventions targeted to the agricultural population (Brumby et al., 2013; Cuthbertson et al., 2022; Derringer & Biddle, 2021; Hagen, 2019; M. Perceval et al., 2020; Price, 2012; Younker & Radunovich, 2021).

The second avenue for future research is connected to the factors that existing studies focus on. Our review identified both the narrow focus on proximal-level factors connected to demographic and economic characteristics in tandem with little attention to distal-level factors. In addition, and in line with the critique in the broader field of suicide, we noted a lack of engagement with theories of suicide. While engagement with theories varies across disciplines, it still generally implies building on our understanding of universality vs. specificities by moving beyond a particular empirical case. This theoretical emptiness has previously been explained by the overly positivist approach, which is driven by quantitative methods and empirical facts (Fitzpatrick, 2015; Hjelmeland & Knizek, 2011; Kral et al., 2012; Rogers, 2001; White et al., 2016). The most effective and immediate way to address the narrowness of the factors studied in the study of suicide in agriculture is by engaging with the theoretical corpus connected to suicidal behavior, self-harm, and self-inflected death, which have been developed across a range of disciplines as noted in the background section, including in anthropology. Critical theoretical insights can also be gained by drawing on other bodies of literature. This includes the body of work on economic, emotional, and environmental trauma (see, for example, Sheftall et al. (2022), Tarrier et al. (2004), Zatti et al. (2017)). We already noted above the importance of leveraging the work of cultural anthropologists, rural sociologists, and human geographers on agrarian change. These scholars also provide critical insights on social capital and cohesion in rural areas, community restructuring, state descaling, and deaths of despair (see, for example, Kearney (1995); Keating (2013); Lobao et al. (2008); Recker et al. (2016); Rehder et al. (2021); Thompson et al. (2018)).

The third avenue for future research is connected to research designs. We identified the lack of methodological diversity and rigor as key barriers to knowledge development with concerns about the validity of some of the findings. In line with the call from the general field of study of suicide, an in-depth and nuanced understanding of suicide in agriculture will come from much greater engagement with qualitative and mixed-methods research designs (Hjelmeland & Knizek, 2011; White et al., 2016). We appreciate that vital statistics data and population-level surveillance have likely been a key limiting fac-

tor. We also appreciate that obtaining primary data is costly, timely, sensitive, and challenging given the stigma, and psychological pain associated with suicide. Still, we believe that there is room for much-needed methodological innovation. Given the current emphasis on interviews and focus groups, ethnographies and comparative case studies are powerful methodological approaches to provide an in-depth, longitudinal, and multilevel understanding of the phenomena at play. As noted in the discussion section, opportunities have been missed to leverage the many sources of existing data that could provide insights to enrich these ethnographic and in-depth case studies and that can be merged with quantitative studies based on secondary and primary data. This includes data from agricultural and population census data, policy documents as they pertain to social, economic, and agricultural policies, social media, and new stories (along with the comments to these news stories). The broader literature on mental health in agriculture provides examples of how this can be done (Droz et al., 2014; Heaberlin & Shattuck, 2023; Kilpatrick et al., 2012).

Across these three lines of research is the need to broaden the population of focus. The agricultural population is heterogeneous, and the lived realities of those working in agriculture vary greatly based on their socio-economic status, role as a primary operator vs. hired farm worker, and access to land and financial assets. However, the majority of studies we identified focus on farmers. Therefore, there is an urgent need to balance the focus on farm workers, especially in light of the systemic power imbalances that produce vulnerability. Also essential is research that moves beyond the primary focus on a single farm owner/operator to include the full household unit. Indeed, the consequences of a farmer's suicide on the family, along with the risk of suicide among other household members, have received little attention. Nevertheless, these other household members, most likely to be women and children, play an essential role in the operation of the farm enterprise despite society seldom truly recognizing their contributions (Becot et al., 2022; Bue et al., 2022; International Labour Organization, n.d.; Ogbimi, 1992).

Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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Povzetek

Zaradi stopnjevane pozornosti, namenjene samomoru v kmetijstvu, se je povečalo število ukrepov, ki so delno utemeljeni v raziskavah o tem, kdo najverjetneje umre zaradi samomora, na kakšen način in iz kakšnega(-ih) razloga(-ov). Vendar pa omejeno razumevanje načina preučevanja samomora in omejena vključenost teorij v preteklih študijah sprožata vprašanja o obsegu in vrsti znanja, v katerem so utemeljeni ti posegi. Da bi ocenili prevladujoče metodološke pristope in posledice vrzeli v našem razumevanju samomora, smo opravili sistematični pregled 108 člankov v angleškem jeziku. Uporaba prevladujočega modela zdravstvenih ved za izvedbo pregleda literature zagotavlja tudi prostor za razmislek o znanju, ki je odsotno ali prikrito pri uporabi pretirano pozitivističnih pristopov za prepoznavanje in povzemanje tovrstne literature. Ugotavljamo, da so prevladujoči pristopi preučevanja samomora metodološko ozki, pretirano upoštevajo omejen nabor dejavnikov na ravni posameznika in podcenjujejo ključne dejavnike na strukturni ravni. V skladu s prejšnjimi kritikami naš pregled nakazuje na neustreznost obstoječih intervencij, saj obstoječi nabor znanja ni ustrezno vključil teoretično pomembnih dejavnikov samomora. Naša razmišljanja o trenutnih pristopih izvajanja sistematičnih pregledov literature in vrzeli v literaturi o samomoru zagotavljajo načrt za premostitev disciplinarnih tradicij, hkrati pa pomagajo odpraviti vrzeli v znanju, ki smo jih ugotovili.

KLJUČNE BESEDE: kmetijsko prebivalstvo, samomor, pregled literature, družbene determinante duševnega zdravja

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