

Suicide among agricultural, forestry, and fishery workers: a systematic literature review and meta-analysis

by Justine Klingelschmidt, MPH, Allison Milner, PhD, Imane Khireddine-Medouni, MPH, MD, Katrina Witt, PhD, Evangelos C Alexopoulos, MD, PhD, Susanna Toivanen, PhD, Anthony D LaMontagne, ScD, Jean-François Chastang, PhD, Isabelle Niedhammer, PhD. Scand J Work Environ Health 2018;44(1):3-15.

Table S1. Characteristics of the studies included in the meta-analysis

First author, year	Design	Location, time period	Agricultural, forestry and fishery workers (definition)	Reference group	Suicide (definition)	Effect measure
Agerbo et al., 2007	Case-control study	Denmark, 1991–1997	Danish Standard Classification of Occupations (DISCO-88) <ul style="list-style-type: none"> • Group 61: market-oriented skilled agricultural and fishery workers • Group 613: market-oriented crop and animal producers 	Primary school teachers	Suicides ICD-8 Codes E950-E959 ICD-10 Codes X60-X84	RR (rate ratio)
Alexopoulos et al., 2016 (additional results provided by the first author)	Census survey	Greece, 2000-2009	International Standard Classification of Occupations (ISCO-88) <ul style="list-style-type: none"> • Group 6: skilled agricultural and fishery workers 	All occupational groups	Suicides ICD-10 Codes X60-X84	CMR
Andersen et al., 2010	Register	Australia, 1990-2006	Australian Standard Classification of Occupations (ASCO) <ul style="list-style-type: none"> • Agriculture = farm hands and overseers, shearers, farm overseers, farmers and farm managers Australian and New-Zealand Standard Classification of Occupations (ANZSCO) <ul style="list-style-type: none"> • Farmers = farmers and farm managers not further disclosed, crop farmers, livestock farmers, mixed crop and livestock farmers out of the higher managers level, and farm, forestry and garden workers nfd, crop farm workers, livestock farm workers, mixed crop and livestock farm workers, and other farm, forestry and garden workers 	Employed population	Suicides classified as probable or beyond reasonable doubt	RRs (rate ratios)
Arnautovska et al., 2014	Register	Australia, 2000-2009	Australian and New-Zealand Standard Classification of Occupations (ANZSCO) <ul style="list-style-type: none"> • Farmers = farmers and farm managers not further disclosed, crop farmers, livestock farmers, mixed crop and livestock farmers out of the higher managers level, and farm, forestry and garden workers nfd, crop farm workers, livestock farm workers, mixed crop and livestock farm workers, and other farm, forestry and garden workers 	Non-farmers	Suicides classified as beyond reasonable doubt and probable (but not possible cases)	IRRs (incidence rate ratios)
Browning et al., 2008	Register	Kentucky, North Carolina, South Carolina (USA), 1990-1998	National Center for Health Statistics <ul style="list-style-type: none"> • Farmers = farm operators, managers and workers 	Total white male population (in all occupations)	Suicides ICD-8 Codes E950-E959	OR (calculated from raw data)
Charlton et al., 1995	Case-control study	England and Wales (UK), 1990-1992	<ul style="list-style-type: none"> • Farmers, occupation from death certificate 	Occupational groups, that were not in the 10 highest suicide risk occupational groups	Suicides and undetermined deaths ICD-9 Codes E950-E959, E980-E989 excluding E988.8 Controls = deaths from natural causes	RR (relative risk)
Cohidon et al., 2010	Routine data	France, 1968-1990	<ul style="list-style-type: none"> • Self-employed farmers according to French classification of occupations (PCS) • Agriculture, fishery and forestry according to the French classification of economic activities (NAP) 	<ul style="list-style-type: none"> • Economic activity: non-market sectors • Occupation: managers/professionals 	Suicides ICD-8 and ICD-9 Codes E950-E959	RR (relative risk)
Fleming et al., 1999	Exposed/non-exposed cohort	Florida (USA), 1975-1993	Pesticide applicators licensed in the State of Florida by the Florida Department of Agriculture and Consumer Services (DACS)	General population	Suicides ICD codes, no further precision	SMR
Fragar et al., 2011	Routine data	Australia, 1999-2002	Australian Standard Classification of Occupations (ANZSCO) Farmers and farm managers	General population	Suicides ICD-10 Codes	SMR

Gallagher et al., 2008	Routine data	New-Zealand, 2001-2005	New Zealand Standard Classification of Occupations (NZSCO-99) • Group 6: Agriculture, fisheries and forestry workers	General population	Suicide deaths deemed intentional, with the intent of taking one's own life by coroners	OR (calculated from raw data)
Hassler et al., 2004	Case-control study	Sweden, 1961-2000	Occupational registers of Statistics Sweden and national register of reindeer herding enterprises • Reinddeer herders and reindeer owners • Spouses and children from the kinship registers of Statistics Sweden	Control population of non-Sami	Suicides ICD-10 Codes X60-X84	SMR
Inskip et al., 1996	Census	England and Wales (UK), 1979-80 and 1982-90	Office of Population Census and Surveys (OPCS 1980) classification of occupations • Farming, horticulture and gardening	All occupations	Suicides ICD-9 Codes E950-E959	PMR
Kelly et al., 1998	Retrospective cohort	England and Wales (UK), 1982-1996	Office of Population Census and Surveys (OPCS 1980) classification of occupations • Farmers, horticulturists, farm managers • Farm workers • Forestry workers • Gardeners, groundsmen	General population	Suicides and deaths from injury and poisoning undetermined whether accidentally or purposely inflicted ICD-9 Codes: E950-E959 and E980-E989 excluding E988.8	PMR
Kposowa et al., 1999	Prospective cohort	USA, 1979-1989	• Agriculture, forestry and fisheries • Farmers, farm managers, farm laborers, and farm foremen	• Industry: financial services • Occupation: farmers and farm managers	Suicides ICD-9 Codes E950-E959	RR (relative risk)
Levêque-Morlais et al., 2015	Prospective cohort	France, 2005-2009	Farm owners, farm workers and individuals working for companies or organizations related to agriculture such as private insurance companies, some banks, extension agents, foresters and gardeners	General population	Suicides ICD-10 Codes X60-X84	SMR
Lostao et al., 2006	Routine data	Spain and France, 1980-1982 and 1988-1990	• Spain: ISCO-1968 group 6 agricultural workers • France : French Classification of occupations assigned to ISCO group 6: agricultural owners and farmworkers	Professionnal workers	Suicides ICD-9 Codes E950-E959	RR (rate ratio)
MacFarlane et al., 2011	Nested case-control study	Australia, 1983-2004	International Standard Classification of Occupations (ISCO-88) Pesticide-exposed workers • Agricultural job: crop growers, excluding gardeners and nursery workers (codes 6100-6112,6114), animal producers and mixed crop/animal producers (codes 6114-6139) and agricultural labourers (code 9211) • Horticulture, gardening or nursery job: gardeners, horticultural and nursery workers (code 6113)	All other occupational groups	Suicides ICD-9 (E950-E959) ICD-10 (X60-X84)	OR
Maki et al., 2007	Routine data	Finland, 1971-2000	Statistics Finland Standard • Farmers	All other occupational groups	Suicides ICD-8 and ICD-9 Codes E950-E959 ICD-10 Codes X60-X84 and Y870	OR (calculated from raw data)
McIntosh et al., 2016	Routine data	17 States (USA), 2012	Standard Occupational Classification (SOC-2000) • Farming, fishing and forestry (code 45)	All other occupational groups	Suicide cases identified from the National Violent Death Reporting System (NVDRS)	OR (calculated from raw data)
Meltzer et al., 2008	Register	England and Wales (UK), 2001-2005	Standard Occupational Classification (SOC-2000) • Agricultural trades (code 511) • Farmers (code 5111) and gardeners and groundsmen/women (code 5113)	General population	Suicides and undetermined intent based on coroners and coded using ICD-10	PMR, SMR

Miller et al., 2008	Routine data	Australia, 1997-2001	Residents on agricultural establishments	General population	Suicide cases identified from the National Coroners Information System (NCIS)	OR (calculated from raw data)
Milner et al., 2015	Routine data	Australia, 2001-2009	Australian and New Zealand Standard Classification of Occupations (ANZSCO) • Farmers and farm managers (a subgroup within ANZSCO group 1 managers)	Managers	Suicide cases identified from the National Coroners Information System (NCIS)	RR (rate ratio)
Mustard et al., 2010	Prospective cohort	Canada, 1991-2001	Standard Occupational Classification (SOC-1980) and 1990 National Occupational Classification • Farming (711) • Other farm/horticultural/animal husbandry (718-719) • Fishing/trapping/related (731) • Forestry or logging (751)	All occupations	Suicides ICD-9 E950 to E959 and ICD-10 X60 to X84 and Y87.0	SRR (standardized rate ratio)
Skegg et al., 2010	Routine data	New Zealand, 1973-2004	New Zealand Standard Classification of Occupations (NZSCO) • Farmers and farm workers (6000-6299 except 6172, 6174, 6215, 6216, 6247-9, 6271-3, 6279, 6281, 6284, 6292/6111, 6112, 6121-26, 6144) • Hunters and cullers (6495-6497, 6499/6143)	Total employed population	Suicides ICD-9 codes E950-E959 Deaths by undetermined cause ICD-9 codes E980-E989	SMR
Stark et al., 2006	Register	Scotland (UK), 1981-1999	Information from death records: • Farmers, horticulturalists, farm managers • Forestry workers • Fishermen • Gardeners and groundsmen	All occupational groups	Suicides ICD-9 (E950-E959) ICD-10 (X60-X84) Injuries/poisoning of undetermined intent ICD-9 (E980-E989) ICD-10 (Y10-Y34)	PMR
Suzuki et al., 2013	Routine data	Japan, 1975-2005	Japan Standard Occupational Classification • Agriculture, forestry and fishery workers	Production process and related workers	Suicides ICD-8 and ICD-9 Codes E950-E959 ICD-10 Codes X60-X84	OR
Thelin et al., 2009	Prospective cohort	Sweden, 1989-2001	Farmers defined as persons who owned or rented a farm and who spent at least 25 hours per week working in a farm	Urban referents	Suicides ICD-9 Codes E950-E959 ICD-10 Codes X60-X84	HR
Toivanen et al., 2015 (additional results provided by the first author)	Register	Sweden, 2004-2008	Swedish Standard Industrial Classification (SNI 2002) • Agriculture, Forestry and Fishing Self-employed persons (Physical person engaged in active business, including owners of limited companies, with or without employees) and paid employees	All sectors except Agriculture, Forestry and Fishing	Suicides ICD-10 Codes X60-X84	HR
Van Wijngaarden et al., 2003	Case-control study	USA, 1991-1992	US Bureau of the Census classification system of jobs and industries • Occupations potentially exposed to pesticides (farm worker): veterinarians, pest control occupations, farmers and farm workers, farm managers and supervisors, marine life cultivation workers, nursery workers, groundskeepers and gardeners, animal caretakers, graders and inspectors of agricultural products; and forestry workers and loggers.	Unexposed to pesticides	Suicides ICD-9 Codes E950-E959	OR

Wada et al., 2016	Routine data	Japan, 2010	11 occupations (including agricultural workers, forestry workers, fishery workers) and 19 industries (including agriculture, forestry, and fisheries)	<ul style="list-style-type: none"> • Analysis by occupation Individuals working in sales • Analysis by industry Wholesale and retail workers 	Suicides ICD-10 Codes	IRR (Incident relative risk)
Waggoner et al., 2011	Prospective cohort	North Carolina, Iowa (USA), 1993-2007	Agricultural Health Study <ul style="list-style-type: none"> • Private and commercial pesticide applicators 	General population	Suicides ICD-9 Codes E950-E959 ICD-10 Codes X60-X84	SMR
Zwerling et al., 1995	Routine data	Iowa (USA), 1980-1988	US Bureau of the Census Occupational codes <ul style="list-style-type: none"> • Farmers Codes 473-477, 479, 484, 486-488 	Employed white male non-farmers	Suicides ICD-9 Codes E950- E959	PMR, SMR