APPENDICES

Appendix A. Search strategies for main databases used to retrieve studies to be screened for all Domains.

MEDLINE

1	Prescription Drug Monitoring Programs/
2	controlled substance monitoring.tw.
3	(drug monitoring adj (program* or system* or network*)).tw.
4	narcotic* monitoring.tw.
5	prescription drug monitoring.tw.
6	prescription monitoring.tw.
7	prescription network*.tw.
8	or/1-7

Embase

1	'controlled substance monitoring'
2	'drug monitoring' NEAR/1 (program* OR system* OR network*)
3	'narcotic* monitoring'
4	'prescription drug monitoring'
5	prescription monitoring'
6	'prescription network*'
7	#1 OR #2 OR #3 OR #4 OR #5 OR #6

CINAHL & PsycINFO (identical searches)

1	controlled substance monitoring
2	drug monitoring N1 (program* or system* or network*)
3	narcotic* monitoring
4	prescription drug monitoring
5	prescription monitoring
6	prescription network*
7	S1 OR S2 OR S3 OR S4 OR S5 OR S6

Web of Science

1	TS="controlled substance monitoring"
2	TS=("drug monitoring" NEAR/1 (program* or system* or network*))
3	TS="narcotic* monitoring"
4	TS="prescription drug monitoring"
5	TS="prescription monitoring"
6	TS="prescription network*"
7	#6 OR #5 OR #4 OR #3 OR #2 OR #1

Appendix B. Characteristics of included studies and their reported outcomes.

Study ID	Years of Data	Study N	Jurisdiction, Country	Population	Study Design (Data Collection Method)	Quantitative and/or Qualitative Data	Response Rate	Data Use	Barriers
Barrett 2005	2004	132	Southwest Virginia, United States	physicians	cross-sectional (survey)	quantitative	41%	y	y
Blum 2016	2014	207	New York University Langone Medical Center, New York, United States	attending physicians	cross-sectional (survey)	quantitative	26%	y	y
Chaudhary 2017	NR	168	mid-sized, private, urban university, United States	family nurse practitioners	cross-sectional (survey)	quantitative	20%	y	n
Coleman 2015	2014	7	urban clinic, Mississippi, United States	physicians, nurse practitioners, physician assistant	retrospective chart review (medical charts)	quantitative	NA**	y	n

Study ID	Years of Data	Study N	Jurisdiction, Country	Population	Study Design (Data Collection Method)	Quantitative and/or Qualitative Data	Response Rate	Data Use	Barriers
Delcher 2017	2011-2016	82836	Florida, United States	physicians & dispensing pharmacists	cross-sectional (administrative PMP data)	quantitative	NA**	y	n
Deyo 2018	2011-2014	17734	Oregon, United States	prescribers who had written at least one prescription for opioids	retrospective cohort (administrative PMP data)	quantitative	NA**	y	n
Feldman 2011	2011	95	academic medical center, Ohio, United States	physicians	cross-sectional (survey)	quantitative	61%	y	y
Feldman 2012	2011	95	hospital, Ohio, United States	resident & attending physicians	cross-sectional (survey)	quantitative	61%	y	y
Fendrich 2018	2014	48	Wisconsin, United States	pharmacists	cross-sectional (survey)	quantitative	30%	y	n

Study ID	Years of Data	Study N	Jurisdiction, Country	Population	Study Design (Data Collection Method)	Quantitative and/or Qualitative Data	Response Rate	Data Use	Barriers
Finnell 2017	2014-2015	207	Elsevier subscribers, United States	medical doctors, doctors of osteopathy, nurse practitioners, physician assistants	cross-sectional (survey; pre- & post-educational intervention)	quantitative	NR*	y	n
Fleming 2013	2008-2009	15	15 states, United States	PMP administrators	cross-sectional (survey)	quantitative	50%	y	n
Fleming 2014 (1)	NR	76	emergency medicine conference, Texas, United States	ED physicians	cross-sectional (survey)	quantitative	55%	y	n
Fleming 2014 (2)	2012	261	Texas, United States	community pharmacists	cross-sectional (survey)	quantitative	26%	y	n
Gershman 2014	2013	358	Florida, United States	medical doctors & osteopathic physicians	cross-sectional (survey)	quantitative	8%	y	n

Study ID	Years of Data	Study N	Jurisdiction, Country	Population	Study Design (Data Collection Method)	Quantitative and/or Qualitative Data	Response Rate	Data Use	Barriers
Green 2012	2011	1385	Connecticut & Rhode Island, United States	prescribers	cross-sectional (survey)	quantitative	55%	y	y
Green 2013	2011	294	Connecticut & Rhode Island, United States	pharmacists	cross-sectional (survey)	quantitative	~10%	y	y
Hernandez-Meier 2017	2014	63	Wisconsin, United States	ED physicians	cross-sectional (survey)	quantitative	16%	y	y
Irvine 2014	2012-2013	1058	Oregon, United States	clinicians	cross-sectional (survey)	quantitative	36%	y	n
Kelley 2013 *(Kelly 2016 linked publication)*(36)	2013	141	Florida & Georgia, United States	ED physicians	cross-sectional (survey)	quantitative	NR*	y	y
LeMire 2012	2011	108	North Dakota, United States	advanced practice nurses	cross-sectional (survey)	quantitative	76%	y	y

Study ID	Years of Data	Study N	Jurisdiction, Country	Population	Study Design (Data Collection Method)	Quantitative and/or Qualitative Data	Response Rate	Data Use	Barriers
Lin 2017	2015	405	Maryland, United States	physicians	cross-sectional (survey)	quantitative	44%	y	y
Matusow 2018	2014-2015	13	opioid treatment programs in 13 states, United States	opioid treatment programs	cross-sectional (survey)	quantitative	50%	y	n
McAllister 2015	2014	25	urban university teaching hospital, Florida, United States	ED prescribers	cross-sectional (survey)	quantitative	NA**	y	y
McCauley 2016	2014	87	South Carolina, United States	dentists	cross-sectional (survey)	quantitative	4%	y	y
Norwood 2016 *(Norwood 2016 (2) linked publication)*(37)	2012	1000	Indiana, United States	pharmacists	cross-sectional (survey)	quantitative	15%	y	y

Study ID	Years of Data	Study N	Jurisdiction, Country	Population	Study Design (Data Collection Method)	Quantitative and/or Qualitative Data	Response Rate	Data Use	Barriers
Penm 2018	2016	150	Ohio, United States	ED medical directors	cross-sectional (survey)	quantitative	92%	y	n
Piper 2016	2012	275	Maine, United States	pharmacists	cross-sectional (survey)	quantitative	22%	y	n
Pomerleau 2017	2014	443	seven academic medical centres, United States	ED providers	cross-sectional (survey)	quantitative	54%	y	n
Pugliese 2018	2016 & 2017	1433	California, United States	pharmacists, allopathic physicians, osteopathic physicians	cross-sectional (survey)	quantitative	24%	n	y

Study ID	Years of Data	Study N	Jurisdiction, Country	Population	Study Design (Data Collection Method)	Quantitative and/or Qualitative Data	Response Rate	Data Use	Barriers
Qureshi 2015	2013	231	Midwestern states, United States	high dose prescribers of patients enrolled in Blue Cross plan	cross-sectional (survey)	quantitative	24%	y	n
Riley 2017	2016-2017	684	Ohio, United States	pharmacists	cross-sectional (survey)	quantitative	6%	y	n
Ringwalt 2015	2009-2011	1600	North Carolina, United States	healthcare providers who queried the PMP in the study years	retrospective cohort (North Carolina PMP)	quantitative	NA**	y	n
Rittenhouse 2015	2014	1541	Arkansas, United States	prescribers & dispensers	cross-sectional (survey)	quantitative	42%	y	n
Rutkow 2015	2014	420	all states + DC, United States	primary care physicians	cross-sectional (survey)	quantitative	58%	y	y

Study ID	Years of Data	Study N	Jurisdiction, Country	Population	Study Design (Data Collection Method)	Quantitative and/or Qualitative Data	Response Rate	Data Use	Barriers
Sun 2018	2013-2014	17390	Washington, United States	prescribers with >5 prescriptions during the study period	retrospective cohort (administrative from Washington state PMP)	quantitative	NA**	y	n
Ulbrich 2010	2008	1434	Ohio, United States	pharmacists	cross-sectional (survey)	quantitative	25%	n	y
Wallace 2017	2016	3 providers; 61 patients	rural health clinic, United States	healthcare providers at clinic (physician & advanced practice providers)	cross-sectional (survey & chart review)	quantitative	100%	y	n

Study ID	Years of Data	Study N	Jurisdiction, Country	Population	Study Design (Data Collection Method)	Quantitative and/or Qualitative Data	Response Rate	Data Use	Barriers
Wang 2017	NR	47	21 states, United States	academic pediatric emergency physicians	cross-sectional (survey)	quantitative	19%	y	y
Wixson 2015	2009	402	Kentucky, United States	pharmacists	cross-sectional (survey)	quantitative	28%	y	y
Young 2017	2015-2016	90	Florida, United States	ED physicians	cross-sectional (survey)	quantitative	22%	y	y

Study ID	Years of Data	Study N	Jurisdiction, Country	Population	Study Design (Data Collection Method)	Quantitative and/or Qualitative Data	Response Rate	Data Use	Barriers
Deyo 2015 *(Leichtling 2017 linked publication)*(38)	2011-2013	1058 survey, 33 interview	Oregon, United States	prescribers (survey); prescribers & pharmacists (administrative data); physicians (interview)	cross-sectional (survey & administrative PMP data & interviews)	quantitative & qualitative	59% (frequent users), 52% (infrequent users), 25% (non registrants) (survey); 55% (interviews)	y	y
Fazio 2017	NR	117 survey, 18 interview	California, United States	physicians	cross-sectional (survey & interview)	quantitative & qualitative	7.9% (survey)	y	Y
Perrone 2012	2011-2012	205	35 states, United States	medical toxicologists	cross-sectional (survey)	quantitative & qualitative	46%	y	y

Study ID	Years of Data	Study N	Jurisdiction, Country	Population	Study Design (Data Collection Method)	Quantitative and/or Qualitative Data	Response Rate	Data Use	Barriers
Warren 2016	2015	8	rural health clinics, Northwestern North Dakota, United States	healthcare administrators and providers	case series (survey & interview)	quantitative & qualitative	NA**	y	y
Carnes 2017	2013	1747	Indiana, United States	providers	cross-sectional (survey)	qualitative	15%	n	y
Click 2017	2012	32	three clinics in East Tennessee & two in Southwest Virginia, United States	primary care providers, clinic directors, and clinical pharmacists	cross-sectional (focus groups)	qualitative	NA**	n	y
Hildebran 2014	2012	35	9 states, United States	clinicians	cross-sectional (focus group & telephone interview)	qualitative	45%	y	y

Study ID	Years of Data	Study N	Jurisdiction, Country	Population	Study Design (Data Collection Method)	Quantitative and/or Qualitative Data	Response Rate	Data Use	Barriers
Homant 2006†	2004	11	Michigan, United States&	physicians & pharmacists	cross-sectional (interviews)	qualitative	NA**	y	y
Naiman 2013	2012	4	near-Chicago suburb, United States	ED physicians	cross-sectional (focus group)	qualitative	NR*	n	y
Poon 2016	2014-2015	17	large urban academic medical center, United States	ED providers	cross-sectional (semi-structured interviews)	qualitative	85%	y	y
Radomski 2018	2016	42	Massachusetts, Illinois, Pennsylvania, United States	primary care physicians with Veteran's Affairs	cross-sectional (semi-structured interviews)	qualitative	13%	y	y

Study ID	Years of Data	Study N	Jurisdiction, Country	Population	Study Design (Data Collection Method)	Quantitative and/or Qualitative Data	Response Rate	Data Use	Barriers
Smith 2015	2012	61	national meeting of American College of Emergency Physicians, United States	ED physicians	cross-sectional (semi-structured interviews)	qualitative	NA**	n	y
Worley 2015	NR	15	United States	psychiatrists and psychiatric nurse practitioners	cross-sectional (interview)	qualitative	NA**	n	y

NOTE: Linked publications are publications that were identified by the research team as using the same study population, and therefore only one of the linked studies was included in our analyses. We identified and cited the linked publication that was not used in our analyses for reference.

Appendix C. Characteristics of PMP by jurisdiction, collected from PDMP Assist.

Jurisdiction	Year PMP became Operational [a]	State Population [a]	Agency Type [a]	Mandatory Enrollment [b]	Mandatory Checking [c]	Mandatory Training [d]	Substances Tracked [a]	Data Collection Frequency [a]	Reports to Prescribers [e]	Reports to Dispensers [f]
Alabama	2006	4,858,979	Department of Health	Prescribers	Prescribers	None	Schedules II-V & Drugs of Concern	Daily	Solicited & Unsolicited	Solicited & Unsolicited
Alaska	2011	738,068	Pharmacy Board	Prescribers & Dispensers	Prescribers	None	Schedules II-IV	Daily	Solicited	Solicited
Arizona	2008	7,123,898	Pharmacy Board	Prescribers & Dispensers	Prescribers & Dispensers	None	Schedules II-V	Daily	Solicited & Unsolicited	Solicited
Arkansas	2013	3,020,327	Department of Health	Prescribers & Dispensers	Prescribers	None	Schedules II-V & Drugs of Concern	Daily	Solicited	Solicited & Unsolicited
California	1939	39,776,830	Law Enforcement	Prescribers & Dispensers	Prescribers	None	Schedules II-IV	Weekly	Solicited & Unsolicited	Solicited
Colorado	2007	5,684,203	Pharmacy Board	Prescribers & Dispensers	Prescribers	None	Schedules II-V	Daily	Solicited	Solicited & Unsolicited
Connecticut	2008	3,588,683	Consumer Protection Agency	Prescribers & Dispensers	Prescribers & Dispensers	None	Schedules II-V	Daily	Solicited & Unsolicited	Solicited & Unsolicited
Delaware	2012	971,180	Professional Licensing Agency	Prescribers	Prescribers & Dispensers	None	Schedules II-V	Daily	Solicited & Unsolicited	Solicited & Unsolicited
District of Columbia	2016	703,608	Department of Health	Not Required	Not Required	None	Schedules II-V & Drugs of Concern	Daily	Solicited	Solicited
Florida	2011	21,312,211	Department of Health	Prescribers & Dispensers	Prescribers & Dispensers	Prescribers & Dispensers	Schedules II-V	Daily	Solicited & Unsolicited	Solicited

Jurisdiction	Year PMP became Operational [a]	State Population [a]	Agency Type [a]	Mandatory Enrollment [b]	Mandatory Checking [c]	Mandatory Training [d]	Substances Tracked [a]	Data Collection Frequency [a]	Reports to Prescribers [e]	Reports to Dispensers [f]
Georgia	2013	10,545,138	Department of Health	Prescribers	Prescribers	None	Schedules II-V	Daily	Solicited	Solicited
Guam	2013	165,374	Department of Health	Dispensers	Prescribers	Prescribers & Dispensers	Schedules II-V	Bi-Weekly	Solicited	Solicited
Hawaii	1943	1,426,393	Law Enforcement Agency	Prescribers & Dispensers	Prescribers	None	Schedules II-V	Weekly	Solicited & Unsolicited	Solicited
Idaho	1967	1,753,860	Pharmacy Board	Prescribers & Dispensers	Not Required	None	Schedules II-V	Daily	Solicited & Unsolicited	Solicited & Unsolicited
Illinois	1968	12,768,320	Department of Health	Prescribers	Prescribers	Prescribers & Dispensers	Schedules II-V	Daily	Solicited & Unsolicited	Solicited & Unsolicited
Indiana	1998	6,699,629	Professional Licensing Agency	Prescribers & Dispensers	Prescribers & Dispensers	None	Schedules II-V & Drugs of Concern	Daily	Solicited & Unsolicited	Solicited & Unsolicited
Iowa	2009	3,160,553	Pharmacy Board	Prescribers	Prescribers	None	Schedules II-IV	Daily	Solicited & Unsolicited	Solicited
Kansas	2011	2,918,515	Pharmacy Board	Not Required	Not Required	None	Schedules II-IV & Drugs of Concern	Daily	Solicited & Unsolicited	Solicited & Unsolicited
Kentucky	1999	4,472,265	Department of Health	Prescribers & Dispensers	Prescribers	Prescribers & Dispensers	Schedules II-V & Drugs of Concern	Daily	Solicited	Solicited
Louisiana	2008	4,682,509	Pharmacy Board	Prescribers & Dispensers	Prescribers	None	Schedules II-V & Drugs of Concern	Daily	Solicited & Unsolicited	Solicited & Unsolicited
Maine	2004	1,341,582	Substance Abuse Agency	Prescribers & Dispensers	Prescribers & Dispensers	None	Schedules II-IV	Daily	Solicited & Unsolicited	Solicited

Jurisdiction	Year PMP became Operational [a]	State Population [a]	Agency Type [a]	Mandatory Enrollment [b]	Mandatory Checking [c]	Mandatory Training [d]	Substances Tracked [a]	Data Collection Frequency [a]	Reports to Prescribers [e]	Reports to Dispensers [f]
Maryland	2013	6,079,602	Substance Abuse Agency	Prescribers & Dispensers	Prescribers & Dispensers	Prescribers & Dispensers	Schedules II-V	Daily	Solicited & Unsolicited	Solicited & Unsolicited
Massachusetts	1994	6,895,917	Department of Health	Prescribers	Prescribers & Dispensers	Prescribers	Schedules II-V & Drugs of Concern	Daily	Solicited & Unsolicited	Solicited
Michigan	1989	9,991,177	Professional Licensing Agency	Prescribers	Prescribers	None	Schedules II-V	Daily	Solicited & Unsolicited	Solicited
Minnesota	2010	5,628,162	Pharmacy Board	Prescribers & Dispensers	Prescribers	None	Schedules II-V & Drugs of Concern	Daily	Solicited & Unsolicited	Solicited & Unsolicited
Mississippi	2005	2,982,785	Pharmacy Board	Prescribers & Dispensers	Prescribers & Dispensers	None	Schedules II-V & Drugs of Concern	Daily	Solicited	Solicited
Missouri*	2017	6,135,888	Department of Health	Not Required	Not Required	None	Schedules II-IV	Daily	Solicited	Solicited
Montana	2012	1,062,330	Pharmacy Board	Not Required	Not Required	Prescribers & Dispensers	Schedules II-V	Daily	Solicited	Solicited
Nebraska	2011	1,932,549	Department of Health	Not Required	Not Required	Prescribers & Dispensers	Schedules II-V & Drugs of Concern	Daily	Solicited	Solicited
Nevada	1997	3,056,824	Pharmacy Board	Prescribers & Dispensers	Prescribers	Prescribers & Dispensers	Schedules II-IV	Daily	Solicited & Unsolicited	Solicited & Unsolicited
New Hampshire	2014	1,350,575	Pharmacy Board	Prescribers & Dispensers	Prescribers	None	Schedules II-IV	Daily	Solicited & Unsolicited	Solicited & Unsolicited
New Jersey	2011	9,032,872	Law Enforcement	Prescribers & Dispensers	Prescribers & Dispensers	Prescribers & Dispensers	Schedules II-V &	Daily	Solicited	Solicited

Jurisdiction	Year PMP became Operational [a]	State Population [a]	Agency Type [a]	Mandatory Enrollment [b]	Mandatory Checking [c]	Mandatory Training [d]	Substances Tracked [a]	Data Collection Frequency [a]	Reports to Prescribers [e]	Reports to Dispensers [f]
							Drugs of Concern			
New Mexico	2005	2,090,708	Pharmacy Board	Prescribers & Dispensers	Prescribers & Dispensers	Prescribers & Dispensers	Schedules II-V	Daily	Solicited & Unsolicited	Solicited
New York	1973	19,862,512	Department of Health	Not Required	Prescribers	None	Schedules II-V & Drugs of Concern	Daily	Solicited	Solicited
North Carolina	2007	10,390,149	Substance Abuse Agency	Prescribers & Dispensers	Prescribers & Dispensers	None	Schedules II-V	Daily	Solicited & Unsolicited	Solicited & Unsolicited
North Dakota	2007	755,238	Pharmacy Board	Prescribers & Dispensers	Prescribers & Dispensers	None	Schedules II-V & Drugs of Concern	Daily	Solicited & Unsolicited	Solicited & Unsolicited
Ohio	2006	11,694,664	Pharmacy Board	Prescribers & Dispensers	Prescribers & Dispensers	None	Schedules II-V & Drugs of Concern	Daily	Solicited	Solicited
Oklahoma	1991	3,940,521	Law Enforcement	Prescribers	Prescribers	None	Schedules II-V	Daily	Solicited & Unsolicited	Solicited & Unsolicited
Oregon	2011	4,199,563	Department of Health	Prescribers & Dispensers	Dispensers	None	Schedules II-IV & Drugs of Concern	3 Days	Solicited	Solicited
Pennsylvania	1973	12,823,989	Department of Health	Prescribers & Dispensers	Prescribers & Dispensers	None	Schedules II-V	Daily	Solicited	Solicited
Puerto Rico	2018	3,337,177	Substance Abuse Agency	Not Required	Not Required	None	Schedules II-V & Other Drugs of Concern	Bi-Weekly	Solicited	Solicited

Jurisdiction	Year PMP became Operational [a]	State Population [a]	Agency Type [a]	Mandatory Enrollment [b]	Mandatory Checking [c]	Mandatory Training [d]	Substances Tracked [a]	Data Collection Frequency [a]	Reports to Prescribers [e]	Reports to Dispensers [f]
Rhode Island	1979	1,061,712	Department of Health	Prescribers & Dispensers	Prescribers	None	Schedules II-IV	Daily	Solicited & Unsolicited	Solicited & Unsolicited
South Carolina	2008	5,088,916	Department of Health	Not Required	Prescribers	Prescribers & Dispensers	Schedules II-IV	Daily	Solicited & Unsolicited	Solicited
South Dakota	2011	877,790	Pharmacy Board	Prescribers	Prescribers	None	Schedules II-V	Daily	Solicited & Unsolicited	Solicited & Unsolicited
Tennessee	2006	6,782,564	Pharmacy Board	Prescribers & Dispensers	Prescribers & Dispensers	None	Schedules II-V	Daily	Solicited & Unsolicited	Solicited
Texas	1982	28,704,330	Pharmacy Board	Prescribers & Dispensers	Prescribers & Dispensers	None	Schedules II-V	Daily	Solicited & Unsolicited	Solicited & Unsolicited
Utah	1996	3,159,345	Professional Licensing Agency	Prescribers	Prescribers & Dispensers	Prescribers	Schedules II-V & Drugs of Concern	Daily	Solicited & Unsolicited	Solicited & Unsolicited
Vermont	2009	623,960	Department of Health	Prescribers & Dispensers	Prescribers & Dispensers	None	Schedules II-IV	Daily	Solicited & Unsolicited	Solicited
Virginia	2003	8,525,660	Professional Licensing Agency	Prescribers & Dispensers	Prescribers	None	Schedules II-V & Drugs of Concern	Daily	Solicited & Unsolicited	Solicited
Washington	2011	7,530,552	Department of Health	Prescribers & Dispensers	Prescribers	None	Schedules II-V	Daily	Solicited	Solicited
West Virginia	1995	1,803,077	Pharmacy Board	Prescribers & Dispensers	Prescribers	Prescribers & Dispensers	Schedules II-V & Drugs of Concern	Daily	Solicited & Unsolicited	Solicited & Unsolicited
Wisconsin	2013	5,818,049	Professional Licensing Agency	Not Required	Prescribers	None	Schedules II-V	Daily	Solicited & Unsolicited	Solicited

Jurisdiction	Year PMP became Operational [a]	State Population [a]	Agency Type [a]	Mandatory Enrollment [b]	Mandatory Checking [c]	Mandatory Training [d]	Substances Tracked [a]	Data Collection Frequency [a]	Reports to Prescribers [e]	Reports to Dispensers [f]
Wyoming	2004	573,720	Pharmacy Board	Prescribers & Dispensers	Not Required	None	Schedules II-V	Daily	Solicited & Unsolicited	Solicited & Unsolicited

[a] PDMP TTAC. State Profiles. http://www.pdmpassist.org/content/state-profiles.
[b] PDMP TTAC. Engaged in Sending Solicited and Unsolicited Reports to Prescribers. http://www.pdmpassist.org/content/pdmp-maps-and-tables. Published 2018.
[c] PDMP TTAC. PDMP Mandatory Query by Prescribers and Dispensers. http://www.pdmpassist.org/content/pdmp-maps-and-tables. Published 2016.
[d] PDMP TTAC. PDMP Mandatory Training of Prescribers and Dispensers. http://www.pdmpassist.org/content/pdmp-maps-and-tables. Published 2018.
[e] PDMP TTAC. PDMP Mandatory Enrollment of Prescribers and Dispensers. http://www.pdmpassist.org/content/pdmp-maps-and-tables. Published 2019.
[f] PDMP TTAC. Engaged in Sending Solicited and Unsolicited Reports to Dispensers. http://www.pdmpassist.org/content/pdmp-maps-and-tables. Published 2018.

Appendix D. Detailed risk of bias and quality assessments for included studies ((a) – AXIS, (b) – CASP.

(a) AXIS

Study ID	AXIS Item																			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Barrett 2005	yes	yes	no	yes	yes	yes	no	yes	yes	yes	yes	no	yes	no	no	yes	no	yes	no	yes
Blum 2016	yes	yes	no	yes	yes	no	no	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	yes
Chaudhary 2017	yes	yes	no	yes	no	no	no	yes	yes	yes	yes	no	yes	no	yes	yes	yes	yes	no	yes
Coleman 2015	yes	yes	no	yes	no	no	no	yes	yes	yes	no	no	yes	no	yes	yes	yes	yes	no	yes
Delcher 2017	yes	yes	no	yes	yes	yes	NA	yes	yes	yes	yes	yes	NA	NA	yes	yes	yes	yes	no	yes
Deyo 2015	yes	yes	no	yes	yes	yes	no	yes	yes	no	yes	no	yes	yes	yes	yes	yes	yes	no	yes
Deyo 2018	yes	yes	no	yes	yes	yes	NA	yes	yes	yes	yes	yes	NA	NA	yes	yes	yes	yes	no	yes
Fazio 2017	yes	yes	no	yes	yes	no	no	yes	yes	NA	yes	yes	yes	no	yes	yes	yes	yes	no	yes
Feldman 2011	yes	yes	no	yes	yes	no	no	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	yes
Feldman 2012	yes	yes	yes	yes	no	no	no	yes	yes	yes	yes	yes	no	no	yes	yes	yes	yes	no	yes
Fendrich 2018	yes	yes	no	yes	yes	no	no	yes	yes	yes	no	yes	yes	no	yes	no	yes	yes	no	yes
Finnell 2017	no	yes	no	yes	no	no	no	yes	yes	yes	yes	no	yes	no	no	yes	yes	yes	no	no
Fleming 2013	yes	yes	yes	yes	yes	yes	no	no	yes	NA	no	no	yes	no	yes	yes	no	yes	no	yes
Fleming 2014a	yes	yes	no	yes	yes	no	no	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	yes
Fleming 2014b	yes	yes	no	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	yes
Gershman 2014	yes	yes	no	yes	yes	yes	no	yes	no	NA	no	no	yes	no	yes	no	yes	yes	no	yes
Green 2012	yes	yes	no	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	yes	yes	yes	yes	no	yes
Green 2013	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	yes
Hernandez-Meier 2017	yes	yes	no	yes	yes	no	no	yes	no	NA	yes	yes	yes	no	yes	yes	yes	yes	no	yes
Irvine 2014	yes	yes	no	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	no	yes	no	yes	yes	no	yes
Kelley 2013	yes	yes	yes	yes	no	no	no	yes	yes	yes	yes	no	yes	no	no	yes	yes	yes	no	yes
LeMire 2012	yes	yes	no	yes	no	no	no	yes	no	no	no	no	no	no	yes	yes	no	no	no	yes
Lin 2017	yes	yes	no	yes	yes	yes	no	yes	yes	yes	yes	no	yes	no	no	yes	yes	yes	no	yes
Matusow 2018	yes	yes	no	yes	no	no	yes	yes	no	no	no	yes	no	yes	no	yes	yes	yes	no	yes
McAllister 2015	yes	yes	no	no	yes	no	no	no	no	no	no	no	yes	no	no	yes	no	yes	no	yes
McCauley 2016	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no	no	yes	no	no	yes	yes	yes	no	yes

Study ID	AXIS Item																			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Norwood 2016	yes	no	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	no	yes
Penm 2018	yes	no	no	yes	yes	yes	no	yes	yes	yes	yes	no	no	no	no	yes	yes	yes	no	yes
Perrone 2012	yes	yes	no	yes	yes	yes	no	yes	yes	no	no	no	yes	no	no	yes	yes	yes	no	yes
Piper 2016	yes	yes	no	yes	yes	yes	no	yes	no	no	no	no	yes	yes	yes	yes	yes	yes	no	yes
Pomerleau 2017	yes	yes	no	yes	yes	yes	no	yes	no	no	yes	no	no	no	no	yes	yes	yes	no	yes
Pugliese 2018	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes
Qureshi 2015	yes	yes	no	yes	yes	yes	no	yes	yes	NA	no	yes	yes	no	yes	no	yes	yes	no	no
Riley 2017	yes	yes	yes	yes	yes	yes	no	no	no	NA	no	yes	yes	no	yes	yes	yes	yes	no	yes
Ringwalt 2015	yes	yes	yes	yes	yes	yes	NA	yes	yes	NA	yes	yes	NA	NA	yes	yes	yes	yes	no	yes
Rittenhouse 2015	yes	yes	yes	yes	yes	yes	no	yes	no	yes	yes	yes	yes	no	yes	yes	yes	yes	no	yes
Rutkow 2015	no	yes	no	yes	yes	no	yes	yes	no	yes	yes	yes	yes	no	yes	yes	yes	yes	no	yes
Sun 2018	yes	yes	yes	yes	yes	yes	NA	yes	yes	yes	yes	yes	NA	NA	yes	yes	yes	yes	no	yes
Ulbrich 2010	yes	yes	no	yes	yes	no	no	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	yes
Wallace 2017	yes	yes	no	yes	yes	yes	NA	yes	no	yes	yes	yes	NA	NA	yes	yes	yes	yes	no	yes
Wang 2017	yes	yes	no	yes	yes	no	no	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	no	no	yes
Warren 2016	no	no	no	yes	yes	yes	no	yes	no	NA	no	yes	NA	NA	yes	no	no	yes	no	yes
Wixson 2015	yes	yes	no	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	yes
Young 2017	yes	yes	no	yes	no	no	no	yes	no	NA	no	yes	yes	no	yes	no	yes	yes	no	yes

(b) CASP

Study ID	CASP Item									
	Was there a clear statement of the aims of the research?	**Is a qualitative methodology appropriate?**	**Was the research design appropriate to address the aims of the research?**	**Was the recruitment strategy appropriate to the aims of the research?**	**Was the data collected in a way that addressed the research issue?**	**Has the relationship between researcher & participants been adequately considered?**	**Have ethical issues been taken into consideration?**	**Was the data analysis sufficiently rigorous?**	**Is there a clear statement of findings?**	**How valuable is the research?**
Carnes 2017	yes	yes	yes	yes	yes	yes	yes	yes	yes	Demonstrates its value
Click 2017	yes	yes	yes	no	yes	no	yes	yes	yes	Demonstrates its value
Deyo 2015	yes	yes	yes	yes	yes	yes	yes	yes	yes	Demonstrates its value
Fazio 2017	yes	yes	yes	no	yes	yes	yes	yes	yes	Demonstrates its value
Hildebran 2014	yes	yes	yes	yes	yes	no	yes	yes	yes	Demonstrates its value
Homant 2006	yes	yes	yes	no	yes	yes	yes	no	yes	Demonstrates its value
Naiman 2013	yes	yes	yes	yes	yes	no	yes	no	yes	Demonstrates its value
Perrone 2012	yes	yes	no	yes	yes	no	yes	no	yes	Value not demonstrated
Poon 2016	yes	yes	yes	yes	yes	no	no	no	yes	Demonstrates its value
Radomski 2018	yes	yes	yes	yes	yes	no	yes	yes	yes	Demonstrates its value
Smith 2015	yes	yes	yes	no	yes	no	no	yes	yes	Demonstrates its value
Warren 2016	yes	yes	yes	yes	yes	yes	yes	yes	yes	Demonstrates its value

	CASP Item									
Study ID	**Was there a clear statement of the aims of the research?**	**Is a qualitative methodology appropriate?**	**Was the research design appropriate to address the aims of the research?**	**Was the recruitment strategy appropriate to the aims of the research?**	**Was the data collected in a way that addressed the research issue?**	**Has the relationship between researcher & participants been adequately considered?**	**Have ethical issues been taken into consideration?**	**Was the data analysis sufficiently rigorous?**	**Is there a clear statement of findings?**	**How valuable is the research?**
Worley 2015	yes	yes	yes	yes	yes	yes	yes	yes	yes	Value not demonstrated

Appendix E. Results of pooled proportion meta-analysis of ever PMP data use by year.