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All Studies

Table 2.3. Summary table of all studies

Study	Study type	Country	Jurisdiction	Care setting /age category	No patients	Criteria	PIP Prevalence
O'Sullivan <i>et al.</i> '13 ^[1]	Observational	Ireland	Europe	Long term care ≥ 65	732	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 70.0% 2003 Beers' criteria PIP prevalence: 53.4%
Vishwas <i>et al.</i> '12 ^[2]	Observational	India	Asia	Hospital ≥ 60	540	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 13.3% 2003 Beers' criteria PIP prevalence: 24.6%
Chen <i>et al.</i> '12 ^[3]	Observational	Malaysia	Asia	Long term care ≥ 65	211	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 23.7% 2003 Beers' criteria PIP prevalence: 32.7%
Bakken <i>et al.</i> '12 ^[4]	Observational	Norway	Europe	Mixed dataset ≥ 70	400	2009 NORGE criteria	2009 NORGE criteria PIP prevalence: Overall: 24.1% at admission 34.8% at discharge Nursing Home 25.5% at admission 33.1% at discharge Medical Ward: 22.6% at admission 36.8% at discharge
Bradley <i>et al.</i> '12 ^[5]	Observational	Northern Ireland	Europe	Community dwelling ≥ 70	166,108	Modified 2008 STOPP criteria	Modified 2008 STOPP criteria PIP prevalence: 34.0%
Nyborg <i>et al.</i> '12 ^[6]	Observational	Norway	Europe	Community dwelling ≥ 70	445,900	2009 NORGE criteria	2009 NORGE criteria PIP prevalence: 34.8%
Oliveira <i>et al.</i> '12 ^[7]	Observational	Brazil	South America	Community dwelling ≥ 60	139	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 34.5%
Yasein <i>et al.</i> '12 ^[8]	Observational	Jordan	Asia	Hospital ≥ 65	400	2003 Beers' criteria	2003 Beers' ID criteria PIP prevalence: 29.5% 2003 Beers' CD criteria PIP prevalence: 7.0%
Garcia-Gollarte <i>et al.</i> '12 ^[9]	Observational	Spain	Europe	Long term care ≥ 65	100	2008 STOPP criteria 2008 START criteria 2006 Australian criteria	2008 STOPP PIP prevalence: 79.0%. 2006 Australian PIP prevalence: 95.0%. 2008 START PPO prevalence: 74.0%..
Ubeda <i>et al.</i> '12 ^[10]	Observational	Spain	Europe	Long term care ≥ 65	81	2008 STOPP criteria 2008 START criteria 2003 Beers criteria	Combined criteria PIP prevalence: 64.0% 2008 STOPP PIP prevalence: 48.0%. 2003 Beers' criteria PIP prevalence: 25.0%. 2008 START PPO prevalence: 44.0%..
Ryan <i>et al.</i> '12 ^[11]	Observational	Ireland	Europe	Long term care ≥ 65	313	2008 STOPP criteria	2008 STOPP PIP prevalence: 59.8%.

						2008 START criteria	2008 START PPO prevalence: 42.2%..
Dalleur <i>et al.</i> ' 12 ^[12]	Observational	Belgium	Europe	Hospital ≥ 75	302	2008 STOPP criteria 2008 START criteria	2008 STOPP PIP prevalence: 48.0%. 2008 START PPO prevalence: 63.0%..
Parsons <i>et al.</i> ' 12 ^[13]	Observational	UK	Europe	Long term care ≥ 65	133	Modified 2008 STOPP criteria	Modified 2008 STOPP criteria PIP prevalence: Time point 1: 46.2% Time point 2: 40.9%
Wahab <i>et al.</i> ' 12 ^[14]	Observational	Australia	Australia	Hospital ≥ 65	100	2008 STOPP criteria	2008 STOPP PIP prevalence: 60.0%.
Al-Omar <i>et al.</i> ' 12 ^[15]	Observational	Saudi Arabia	Asia	Hospital ≥ 65	2,052	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 29.5%
Amann <i>et al.</i> ' 12 ^[16]	Observational	Germany	Europe	Community dwelling ≥ 65	804,400	2010 PRISCUS List	2010 PRISCUS List PIP prevalence: 25.0-28.3%
Fouquet <i>et al.</i> ' 12 ^[17]	Observational	France	Europe	Hospital ≥ 75	150	2003 French modified Beers' criteria 2000 Modified IPET criteria	Combined criteria PIP prevalence: 26.7% 2003 French modified Beers' criteria PIP prevalence: 24.0%. 2000 Modified IPET criteria PIP prevalence: 9.3%.
Shah <i>et al.</i> ' 12 ^[18]	Observational	UK	Europe	Mixed dataset ≥ 65	Nursing Home (NH)- 10, 387 Community dwelling (CD)- 403,259	Modified 2003 Beers' criteria	Modified 2003 Beers' criteria PIP prevalence: Nursing Home: 33.0% Community dwelling: 21.4%
Borges <i>et al.</i> ' 11 ^[19]	Observational	Portugal	Europe	Hospital ≥ 65	105	2008 START criteria	2008 START criteria PPO prevalence: 41.9%.
Goltz <i>et al.</i> ' 11 ^[20]	Observational	Germany	Europe	Community dwelling ≥ 65	2003- 12,513,584 2004- 10,126,809	Modified 2003 Beers' criteria	Modified 2003 Beers' criteria PIP prevalence: 2003: 21.7% 2004: 18.2%
Pugh <i>et al.</i> ' 11 ^[21]	Observational	US	US	Community dwelling ≥ 65	1,567,467	2006 HEDIS criteria (HRME)	2006 HEDIS criteria PIP prevalence: 2004: 13.1% 2005: 12.8% 2006: 12.3%
Kolzsch <i>et al.</i> '11 ^[22]	Observational	Germany	Europe	Long term care ≥ 65	8,685	Modified German 2007 La Roche criteria	2007 La Roche criteria PIP prevalence: 21.9%
Gopinath <i>et al.</i> '11 ^[23]	Observational	India	Asia	Hospital ≥ 65	170	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 45.3 %
Widagdo <i>et al.</i> '11 ^[24]	Observational	Australia	Australia	Hospital ≥ 65	100	2003 Beers' criteria (high severity)	2003 Beers' criteria PIP prevalence: Admission: 42% Discharge: 39%

Dunn <i>et al.</i> '11 ^[25]	Intervention	US	US	Community dwelling ≥65	120	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 37.5%
Bao <i>et al.</i> '11 ^[26]	Observational	US	US	Community dwelling ≥65	3,124	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 38%
Lund <i>et al.</i> '11 ^[27]	Intervention	US	US	Community dwelling ≥65	407	1997 Beers' criteria 2003 Beers' criteria	1997 Beers' criteria PIP prevalence in the PCM patients: 31.1% 2003 Beers' criteria PIP prevalence in the EPOC patients: 44.2%
Lin <i>et al.</i> '11 ^[28]	Observational	Taiwan	Asia	Community dwelling ≥65	327	Modified 2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 5% (90/327)
Woelfel <i>et al.</i> '11 ^[29]	Observational	US	US	Hospital ≥65	295	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 18%
Leikola <i>et al.</i> '11 ^[30]	Observational	Finland	Europe	Community dwelling ≥65	841,509	Modified Finnish 2003 Beers' ID criteria	Modified Finnish 2003 Beers' ID criteria PIP Prevalence: 14.7% (n=123545)
Barnett <i>et al.</i> '11 ^[31]	Observational	UK	Europe	Mixed dataset ≥65	70,299	Modified UK 2003 Beers' ID criteria	Modified UK 2003 Beers' ID criteria PIP prevalence: Community dwelling: 30.9% Long term care: 37.1%
Stafford <i>et al.</i> '11 ^[32]	Observational	Australia	Australia	Long term care ≥65	2,345	2003 Beers' criteria 1997 McLeod criteria	Combined criteria PIP prevalence: 43.8% 2003 Beers' criteria PIP prevalence: 35.3% 1997 McLeod criteria PIP prevalence: 18.7%
Mandavi <i>et al.</i> '11 ^[33]	Observational	India	Asia	Community dwelling ≥60	1,081	Modified 2003 Beers' criteria	2003 Beers' PIP prevalence: 10.8%
Gallagher <i>et al.</i> '11 ^[34]	Observational	Europe	Europe	Hospital ≥65	900	2008 STOPP criteria 2008 START criteria 2003 Beers' criteria	Overall 2008 STOPP PIM prevalence was 51.3%. Ranging from 34.7- 77.3% Overall 2003 Beers' PIP prevalence was 30.4%. Ranging from 22.7-43.3%. Overall 2008 START PPO prevalence was 59.4%. Ranging from 51.3- 72.7%.
Pugh <i>et al.</i> '11 ^[35]	Observational	US	US	Community dwelling ≥65	305,041	Modified 2006 HEDIS criteria	Modified 2006 HEDIS criteria PIP prevalence: 15.2%
Luo <i>et al.</i> '11 ^[36]	Observational	Northern Ireland	Europe	Hospital ≥65	192	2003 Beers' criteria 2000 IPET 2006 HEDIS criteria	2003 Beers' criteria PIP prevalence: 25.1-30.7% 2000 IPET PIP prevalence: 19-27.4% 2006 HEDIS PIP prevalence: 5.6-9.7%
Liu <i>et al.</i> '11 ^[37]	Observational	Taiwan	Asia	Hospital ≥65	520	2008 STOPP criteria 2008 START criteria	2008 STOPP criteria PIP prevalence: 36.2% 2008 START criteria PPO prevalence: 41.9%.

Gallagher <i>et al.</i> '11 ^[38]	Intervention	Ireland	Europe	Hospital ≥ 65	400	2008 STOPP criteria 2008 START criteria 1992 MAI 1999 AOU criteria	2008 combined STOPP and START criteria combined prevalence: 58.4% 1992 MAI prevalence: 48% 1999 AOU criteria prevalence: 37%
Lang <i>et al.</i> '11 ^[39]	Intervention	Switzerland	Europe	Hospital ≥ 65	134	2008 STOPP criteria (French adaption) 2008 START criteria (French adaption)	2008 STOPP criteria PIP prevalence: Admission: 77.3% Discharge: 18.6% 2008 START criteria PPO prevalence: Admission: 64.7% Discharge: 11.2%
Ghadimi <i>et al.</i> '11 ^[40]	Observational	Iran	Asia	Community dwelling ≥ 65	2,041	Modified 2003 Beers' ID criteria.	Modified 2003 Beers' ID PIP prevalence: 30% (27% for men; 33% for women).
Sakuma <i>et al.</i> '11 ^[41]	Observational	Japan	Asia	Hospital ≥ 65	2,155	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 56.1%
Fiss <i>et al.</i> '11 ^[42]	Observational	Germany	Europe	Community dwelling ≥ 65	744	Modified German 2003 Beers' criteria	Modified German 2003 Beers' criteria PIP prevalence: 18%
Shah <i>et al.</i> '11 ^[43]	Observational	India	Asia	Hospital ≥ 65	400	2003 Beers' criteria 1998 Phadke's criteria of rationale prescribing	2003 Beers' criteria PIP prevalence: 27.25% 1998 Phadke's criteria of irrational prescribing prevalence: 28.3%
Hamilton <i>et al.</i> '11 ^[44]	Observational	Ireland	Europe	Hospital ≥ 65	600	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 56.2% 2003 Beers' criteria PIP prevalence: 28.8%
Golden <i>et al.</i> '11 ^[45]	Observational	US	US	Community dwelling ≥ 65	3,911	Modified 2003 Beers' ID criteria (high risk medications)	Modified 2003 Beers ID criteria PIP rate: 25.2%
Albert <i>et al.</i> '10 ^[46]	Observational	US	US	Community dwelling ≥ 65	7,459	Modified 2003 Beers' criteria 2006 HEDIS criteria	2003 Beers' criteria PIP prevalence: 53.5% 2006 HEDIS PIP prevalence: 38.8%
Shiyanbola <i>et al.</i> '10 ^[47]	Observational	US	US	Community dwelling ≥ 65	874	2003 Beers' criteria Modified 2001 ACOVE criteria	2003 Beers' criteria PIP prevalence: 26.5% Modified 2001 ACOVE criteria PIP prevalence: 34.7% Combined criteria PIP prevalence: 45.8%
Lau <i>et al.</i> '10 ^[48]	Observational	US	US	Community dwelling ≥ 65	4,087	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 17% overall 15% in patients with dementia 20% in patients without dementia
Fu <i>et al.</i> '10 ^[49]	Observational	US	US	Community dwelling ≥ 65	1,774	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 2005: 20% 2006: 16%
Akazawa <i>et al.</i>	Observational	Japan	Asia	Community dwelling	6,628	Modified Japanese 2003 Beers'	Modified Japanese 2003 Beers' criteria PIP

'10 ^[50]				≥65		ID criteria	prevalence: 43.6%
Somers <i>et al.</i> '10 ^[51]	Observational	Belgium	Europe	Hospital ≥65	110	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: Admission: 20% Discharge: 16%
Harugeri <i>et al.</i> '10 ^[52]	Observational	India	Asia	Hospital ≥60	814	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 23.5%
Blozik <i>et al.</i> '10 ^[53]	Intervention	Switzerland	Europe	Long term care ≥60	181	Modified Beers' 2003 ID criteria	2003 Beers' PIP rate: 14.5% pre-intervention and 2.8% post-in intervention
Zaveri <i>et al.</i> '10 ^[54]	Observational	India	Asia	Hospital ≥65	407	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 23.59%
Kamuhabwa <i>et al.</i> '10 ^[55]	Observational	Tanzania	Africa	Hospital ≥65	514	Modified 2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 11.4%
Maio <i>et al.</i> '10 ^[56]	Observational	Italy	Europe	Community dwelling ≥65	91,741	Modified 2003 Beers' ID criteria	2003 Beers ID criteria PIP prevalence: 25.8%
Conejos Miquel <i>et al.</i> '10 ^[57]	Observational	Spain	Europe	Mixed dataset ≥65	150	2003 Beers' criteria 2008 STOPP criteria 2008 START criteria	Primary Care 2003 Beers' criteria PIP prevalence: 24% 2008 STOPP criteria PIP prevalence: 36% 2008 START criteria PIP prevalence: 28% Secondary Care 2003 Beers' criteria PIP prevalence: 26% 2008 STOPP criteria PIP prevalence: 54% 2008 START criteria PIP prevalence: 54% Nursing Home Care 2003 Beers' criteria PIP prevalence: 20% 2008 STOPP criteria PIP prevalence: 50% 2008 START criteria PIP prevalence: 46%
Ruggiero <i>et al.</i> '10 ^[58]	Observational	Italy	Europe	Long term care ≥65	1,716	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 48%
Pozzi <i>et al.</i> '10 ^[59]	Observational	Italy	Europe	Community dwelling ≥65	1,022	Modified 1991 Beers' criteria	1991 Beers' criteria PIP prevalence: 9%
Pyszka <i>et al.</i> '10 ^[60]	Observational	US	US	Hospital ≥70	111	Modified 2008 STOPP criteria 2008 START criteria	Modified 2008 STOPP criteria PIP prevalence: 65% at admission 64% at discharge 64% at follow-up 2008 START criteria PPO prevalence: 52% at admission 40% at discharge 35% at follow-up
Lund <i>et al.</i> '10 ^[61]	Observational	US	US	Community dwelling ≥65	240	2003 Beers' criteria 1992 MAI	2003 Beers' criteria PIP prevalence : 48.7% 1992 MAI prevalence: 54.3%

Castelino <i>et al.</i> '10 ^[62]	Observational	Australia	Australia	Community dwelling ≥65	372	2003 Beers' criteria 2007 DBI	2003 Beers' criteria prevalence: 39.8% 2007 DBI PIP prevalence: 60.5%
Lang <i>et al.</i> '10 ^[63]	Observational	Switzerland	Europe	Hospital ≥65	150	2008 STOPP criteria (French adaption) 2008 START criteria (French adaption)	2008 STOPP criteria PIP prevalence: 77% START PPO RATE: 65%.
Cahir <i>et al.</i> '10 ^[64]	Observational	Ireland	Europe	Community dwelling ≥70	338,801	Modified 2008 STOPP criteria	Modified STOPP criteria PIP prevalence: 36% (121 454 claimants)
Pattanworasate <i>et al.</i> '10 ^[65]	Observational	Australia	Australia	Hospital ≥65	202	Modified Australian 2003 Beers' criteria Modified Australian 1997 McLeod criteria Modified 2006 NPS criteria	Combined criteria PIP prevalence: 55% Modified Australian 2003 Beers' criteria PIP prevalence: 44% Modified Australian 1997 McLeod criteria PIP prevalence: 41% Modified 2006 NPS criteria PIP prevalence: 16%
Dedhiya <i>et al.</i> '10 ^[66]	Observational	US	US	Long term care ≥65	7,594	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 42.1%.
Wright <i>et al.</i> '09 ^[67]	Observational	US	US	Hospital ≥65	384	1999 AOU criteria	1999 AOU criteria PPO prevalence: 62%
Ruggiero <i>et al.</i> '09 ^[68]	Observational	Italy	Europe	Long term care ≥65	496	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 27.7%
Bergkvist <i>et al.</i> '09 ^[69]	Intervention	Sweden	Europe	Hospital ≥65	53	1992 MAI	1992 MAI PIP prevalence: Admission: Controls: 96% Intervention: 86% Discharge: Controls: 96% Intervention: 79%
Corsonello <i>et al.</i> '09 ^[70]	Observational	Italy	Europe	Hospital ≥65	506	2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 20.6%
Berdot <i>et al.</i> '09 ^[71]	Observational	France	Europe	Community dwelling ≥65	6,343	Combined criteria (Modified 1997 Beers' ID criteria and modified 2003 Beers' ID criteria and La Roche criteria)	Combined criteria PIP prevalence: 31.6%
Chen <i>et al.</i> '09 ^[72]	Observational	Taiwan	Asia	Hospital ≥65	1,429,463	Modified 2003 Beers' ID criteria	2003 Beers' PIP prevalence: 14.7%
Ryan <i>et al.</i> '09 ^[73]	Observational	Ireland	Europe	Community dwelling ≥65	1,329	2003 Beers' criteria 2008 STOPP criteria 2008 START criteria	2003 Beers' criteria PIP prevalence: 18.3% 2008 STOPP criteria PIP prevalence: 21.4% 2008 START criteria PPO prevalence: 22.7%

Bongue <i>et al.</i> '09 ^[74]	Observational	France	Europe	Community dwelling ≥65	30,683	Modified 1997 Beers' ID criteria 2001 French list of PIP criteria (Based on the 1997 Beers' ID criteria)	Modified 1997 Beers' ID criteria PIP prevalence rate: 10.1% 2001 French list of PIP criteria prevalence rate : 25.4%
Lapi <i>et al.</i> '09 ^[75]	Observational	Italy	Europe	Community dwelling ≥65	568	Modified 1991 Beers' criteria	Modified 1991 Beers' criteria PIP prevalence: 9.1%
Ryan <i>et al.</i> '09 ^[76]	Observational	Ireland	Europe	Community dwelling ≥65	500	2003 Beers' criteria 2000 IPET criteria	2003 Beers' criteria PIP prevalence: 13% 2000 IPET criteria PIP prevalence: 10.4%
Lai <i>et al.</i> '09 ^[77]	Observational	Taiwan	Asia	Hospital ≥65	8,213,147	Modified Taiwanese 2003 Beers' ID criteria	Modified Taiwanese 2003 Beers' ID PIP prevalence: 63.8% over the study period.
Steinman <i>et al.</i> '09 ^[78]	Observational	US	US	Community dwelling ≥65	256	2003 Beers' criteria 2001 Zhan criteria	2003 Beers' criteria PIP prevalence: 53% 2001 Zhan criteria PIP prevalence: 28%
Buck <i>et al.</i> '09 ^[79]	Observational	US	US	Community dwelling ≥65	61,251	2003 Beers' ID criteria 2001 Zhan criteria.	2003 Beers' ID criteria PIP prevalence: Centre 1: 8693 (23.3%) Centre 2: 5528 (23.0%) 2001 Zhan criteria PIP prevalence: Centre 1: 6036 (16.2%) Centre 2: 4160 (17.3%)
Mansur <i>et al.</i> '09 ^[80]	Observational	Israel	Asia	Hospital ≥65	212	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: At admission: 43.5% At discharge: 44.4%
Hale <i>et al.</i> '08 ^[81]	Observational	US	US	Hospital ≥65	100	2003 Beers' criteria	2003 Beers' criteria PIP prevalence Before admission: 39% During hospitalization: 59% At discharge: 41%
Wawruch <i>et al.</i> '08 ^[82]	Observational	Slovakia	Europe	Hospital ≥65	600	Modified 2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 21%
Prudent <i>et al.</i> '08 ^[83]	Observational	France	Europe	Hospital ≥75	1,176	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 28.2%
Gallagher <i>et al.</i> '08 ^[84]	Observational	Ireland	Europe	Hospital ≥65	715	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 35% 2003 Beers' criteria PIP prevalence: 25%
Schuler <i>et al.</i> '08 ^[85]	Observational	Austria	Europe	Hospital ≥75	543	Modified 2003 Beers' criteria	Modified 2003 Beers' criteria PIP prevalence: 30.1%
Carey <i>et al.</i> '08 ^[86]	Observational	UK	Europe	Community dwelling ≥65	218,567	Modified 2003 Beers' criteria	2003 Beers' PIP prevalence: 1996: 32.2% 2005: 28.3%
Hosia-Randell <i>et al.</i>	Observational	Finland	Europe	Long term care ≥65	1,987	Modified 2003 Beers' ID	2003 Beers' PIP prevalence: 34.9%

'08 ^[87]						criteria	
Radozevic <i>et al.</i> '08 ^[88]	Observational	Croatia	Europe	Hospital ≥ 65	225	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence rate: 22%
Pugh <i>et al.</i> '08 ^[89]	Observational	US	US	Mixed dataset ≥ 65	850,154	2001 Zhan criteria	2001 Zhan criteria PIP prevalence: 26.2%
Lin <i>et al.</i> '08 ^[90]	Observational	Taiwan	Asia	Hospital ≥ 65	5,741	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 23.7%
Gallagher <i>et al.</i> '08 ^[91]	Observational	Ireland	Europe	Hospital ≥ 65	597	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 32%
Rothberg <i>et al.</i> '08 ^[92]	Observational	US	US	Hospital ≥ 65	493,971	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 49% (ranged from 34-55%)
Budnitz <i>et al.</i> '07 ^[93]	Observational	US	US	Hospital ≥ 65	177,504	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 10.5%
Spinewine <i>et al.</i> '07 ^[94]	Intervention	Belgium	Europe	Hospital ≥ 70	203	Modified 1997 Beers' ID criteria 1992 MAI 2001 ACOVE criteria	1997 Beers' PIP prevalence: 30% 1992 MAI PIP prevalence: 60% 2001 ACOVE criteria PIP prevalence: 78%
Barry <i>et al.</i> '07 ^[95]	Observational	Ireland	Europe	Hospital ≥ 65	600	2008 START criteria	2008 START criteria PPO prevalence: 57.8%
Rajska-Neumann <i>et al.</i> '07 ^[96]	Observational	Poland	Europe	Community dwelling ≥ 65	1,000	1997 Beers' ID criteria	1997 Beers' ID criteria PIP prevalence: Overall: 28.3 Poznan: 28.6% Glogow: 27.2%
Rossi <i>et al.</i> '07 ^[97]	Observational	US	US	Community dwelling ≥ 60	128	Modified 1992 MAI criteria (unnecessary drug use)	Modified 1992 MAI unnecessary medication prevalence: 58.6%
Fick <i>et al.</i> '07 ^[98]	Observational	US	US	Community dwelling ≥ 65	17,971	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 40.7%
Nixdorff <i>et al.</i> '07 ^[99]	Observational	US	US	Hospital ≥ 65	124	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 29%
Bergman <i>et al.</i> '07 ^[100]	Observational	Sweden	Europe	Long term care ≥ 65	7,904	2008 Swedish quality indicators (incorporating elements of the 1997 Beers' ID criteria)	2008 Swedish quality indicators PIP prevalence: 74%
Mandavi <i>et al.</i> '07 ^[101]	Observational	India	Asia	Hospital ≥ 60	515	Modified 2003 Beers' Criteria	2003 Beers' criteria PIP prevalence: 17.9%
Steinman <i>et al.</i> '07 ^[102]	Observational	US	US	Community dwelling ≥ 65	196	2003 Beers' criteria 1992 MAI	2003 Beers' criteria PIP prevalence: 37% 1992 MAI PIP prevalence: 82%
Hustey <i>et al.</i> '07 ^[103]	Observational	US	US	Hospital ≥ 65	352	2003 Beers' Criteria 2003	2003 Beers' criteria PIP prevalence: 32%
Landi <i>et al.</i> '07 ^[104]	Observational	Italy	Europe	Community dwelling ≥ 80	364	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 26%
Bregnhøj <i>et al.</i> '07 ^[105]	Observational	Denmark	Europe	Community dwelling > 65	212	MAI	1992 MAI PIP prevalence: 94.3%
Roughead <i>et al.</i> '07 ^[106]	Observational	Australia	Australia	Community Dwelling ≥ 70	192,363	Combined criteria (Modified 2003 Beers' ID criteria and	Combined criteria PIP prevalence: 21.2%

						modified 1997 McLeod criteria)	
De Wilde <i>et al.</i> '07 ^[107]	Observational	UK	Europe	Mixed dataset ≥ 65	162,000	Modified 2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 2003: 32.2% (20.5% on high risk medications) 1994: 32.9% (21.4% on high risk medications)
Fahlman <i>et al.</i> '07 ^[108]	Observational	US	US	Community dwelling ≥ 65	4,602	1997 Beers' ID criteria	1997 Beers' ID criteria PIP prevalence: 44%
Bierman <i>et al.</i> '07 ^[109]	Observational	US	US	Community dwelling ≥ 65	965,756	Modified 2001 Zhan criteria	Modified 2001 Zhan criteria PIP prevalence: Men: 25.7% Women: 31%
Fu <i>et al.</i> '07 ^[110]	Observational	US	US	Community dwelling ≥ 65	720	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 15.97%
Cannon <i>et al.</i> '06 ^[111]	Observational	US	US	Hospital ≥ 65	786	Modified 1997 Beers' ID criteria	1997 Beers' PIP prevalence: 31%
De Oliveira Martins <i>et al.</i> '06 ^[112]	Observational	Portugal	Europe	Community dwelling ≥ 65	213	1997 Beers' ID criteria 2003 Beers' ID criteria	1997 Beers' criteria PIP prevalence: 27.7% 2003 Beers' criteria PIP prevalence: 38.5%
Franic <i>et al.</i> '06 ^[113]	Observational	US	US	Community dwelling ≥ 65	444	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 16.7%
Niwata <i>et al.</i> '06 ^[114]	Observational	Japan	Asia	Long term care ≥ 65	1,669	Modified 2003 Beers' criteria	Modified 2003 Beers' criteria PIP prevalence: 21.1%
Saab <i>et al.</i> '06 ^[115]	Observational	Lebanon	Asia	Community dwelling ≥ 65	350	2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 22.4%
Raivio <i>et al.</i> '06 ^[116]	Observational	Finland	Europe	Mixed dataset ≥ 70	425	Modified Finnish 1997 Beers' ID criteria	Modified Finnish 1997 Beers' ID criteria PIP prevalence: 36.2%
Egger <i>et al.</i> '06 ^[117]	Observational	Switzerland	Europe	Hospital ≥ 65	800	Modified Swiss 2003 Beers' criteria	Modified Swiss 2003 Beers' criteria PIP prevalence: Medical ward: Admission: 16.0% Discharge: 13.3% Geriatric ward Admission: 20.8%, Discharge: 15.9%
Barry <i>et al.</i> '06 ^[118]	Observational	Ireland	Europe	Hospital ≥ 65	350	2003 Beers' criteria 2000 IPET	2003 Beers' PIP prevalence: 34.6% 2000 IPET PIP prevalence: 22%
Page <i>et al.</i> '06 ^[119]	Observational	US	US	Hospital ≥ 75	389	Modified 2003 Beers' ID criteria	2003 Beers' PIP prevalence: 27.5%
Maio <i>et al.</i> '06 ^[120]	Observational	Italy	Europe	Mixed dataset ≥ 65	849,425	Modified 2003 Beers' ID criteria	2003 Beers' PIP prevalence: 18%
Wawruch <i>et al.</i> '06 ^[121]	Observational	Slovakia	Europe	Hospital ≥ 65	600	2003 Beers' criteria	2003 Beers' PIP prevalence: Admission: 20.2% Discharge: 20%
Steinman <i>et al.</i> '06	Observational	US	US	Community dwelling	196	2003 Beers' criteria	Modified 1992 MAI PIP prevalence: 57%

[122]				≥65		1999 AOU criteria Modified 1992 MAI criteria (unnecessary drug use)	2003 Beers' criteria PIP prevalence: 37% 1999 AOU criteria PPO prevalence: 64%
Pugh <i>et al.</i> '06 [123]	Observational	US	US	Mixed dataset ≥65	1,096,361	2006 HEDIS criteria	2006 HEDIS criteria PIP prevalence: 19.6%
Barnett <i>et al.</i> '06 [124]	Observational	US	US	Community dwelling ≥65	281150	2001 Zhan criteria	2001 Zhan criteria PIP prevalence: Veterans Administration: 21.3% Health maintenance organization: 28.8%
Maio <i>et al.</i> '06 [125]	Observational	US	US	Community dwelling ≥65	100	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: Family Practice: 22% Senior citizens centre: 26%
Laroche <i>et al.</i> '06 [126]	Observational	France	Europe	Hospital ≥70	2,018	2001 French list of PIP criteria (Based on the 1997 Beers' ID criteria)	2001 French PIP criteria prevalence: 66%
Ay <i>et al.</i> '05 [127]	Observational	Turkey	Asia	Community dwelling ≥70	1,019	Modified Turkish 1997 Beers' ID criteria	Modified Turkish 1997 Beers' ID criteria PIP prevalence: 9.8%
Perri <i>et al.</i> '05 [128]	Observational	US	US	Long term care ≥65	1,117	1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence 46.5%
Hajjar <i>et al.</i> '05 [129]	Observational	US	US	Hospital ≥65	384	Modified 1992 MAI criteria (unnecessary drug use)	Modified 1992 MAI unnecessary drug use prevalence: 44%
Lechevallier-Michel <i>et al.</i> '05 [130]	Observational	France	Europe	Community dwelling ≥65	9,294	2001 French list of PIP criteria (Based on the 1997 Beers' ID criteria)	2001 French PIP criteria prevalence: 38.7%
Roth <i>et al.</i> '05 [131]	Observational	US	US	Community dwelling ≥60	100	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 34%
Azoulay <i>et al.</i> '05 [132]	Observational	Iran	Asia	Community dwelling ≥65	3,000	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: 27.6%
Klarin <i>et al.</i> '05 [133]	Observational	Sweden	Europe	Mixed dataset ≥75	785	Combined criteria (Modified 1997 Beers' criteria and modified 1997 McLeod criteria)	Combined criteria PIP prevalence: 18.6%
Lau <i>et al.</i> '05 [134]	Observational	US	US	Long term care ≥65	3,372	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 50.3%
Viswanathan <i>et al.</i> '05 [135]	Observational	US	US	Hospital ≥65	7,243	Modified 2003 Beers' ID criteria Modified 1997 Beers' ID criteria Modified 2001 Zhan criteria	Modified 2003 Beers' ID criteria PIP prevalence: 13.4% Modified 1997 Beers' ID criteria PIP prevalence: 8.8% Modified Zhan criteria PIP prevalence: 4.2%
Zuckerman <i>et al.</i> '05 [136]	Observational	US	US	Long term care ≥65	546	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: Before admission: Dementia: 20% Without dementia: 23% After admission: Before admission:

							Dementia: 19% Without dementia: 28%
Saltvedt <i>et al.</i> '05 [137]	Intervention	Norway	Europe	Hospital ≥ 75	254	1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: Patients in a geriatric evaluation and management unit: 10% Patients in a general medical ward: 9%
Van der Hooft <i>et al.</i> '05 [138]	Observational	Netherlands	Europe	Hospital ≥ 65	120,218	1997 Beers' criteria 2003 Beers criteria	1997 Beers' criteria PIP prevalence: 16.8%-18.5% 2003 Beers' criteria PIP prevalence: 19.1%-20.0%
Pugh <i>et al.</i> '05 [139]	Observational	US	US	Mixed dataset ≥ 65	1,265,434	Modified 2001 Zhan criteria (including 2003 Beers criteria relating to medications considered potentially inappropriate based on dose)	Modified 2001 Zhan criteria PIP prevalence: 23%
Rigler <i>et al.</i> '05 [140]	Observational	US	US	Mixed dataset ≥ 60	3,185	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: Ambulatory care patients: 21%, Patients in the Kansas Frail Elderly Program :48% Older nursing home residents: 38%
Onder <i>et al.</i> '05 [141]	Observational	US	US	Hospital ≥ 65	5,152	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 28.6%
Chang <i>et al.</i> '05 [142]	Observational	US	US	Community dwelling ≥ 65	550	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 11.6%
Fialova <i>et al.</i> '05 [143]	Observational	Europe-Metropolitan areas of the Czech Republic, Denmark, Finland, Iceland, Italy, the Netherlands, Norway, and the United Kingdom.	Europe	Community dwelling ≥ 65	2,707	Modified 1997 Beers' ID criteria Modified 2003 Beers' ID criteria Modified 1997 McLeod criteria	Overall: Combination of all 3 tools PIP prevalence rate: 19.8 Modified 1997 Beers' ID criteria PIP prevalence: 3.3-17.1% Modified 2003 Beers' ID criteria PIP prevalence: 5.8-25.2% Modified 1997 McLeod criteria PIP prevalence: 3.0-31.8%
Howard <i>et al.</i> '04 [144]	Observational	Canada	Canada	Community dwelling ≥ 65	777	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: 16.3%
Mamun <i>et al.</i> '04 [145]	Observational	Singapore	Asia	Long term care ≥ 65	454	Modified 1997 Beers' criteria	Modified 1997 Beers' criteria PIP prevalence: 70.04%
Chetty <i>et al.</i> '04 [146]	Observational	South Africa	Africa	Mixed dataset ≥ 65	6,410	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence rate: 30.0%

Rigler <i>et al.</i> '04 ^[147]	Observational	US	US	Mixed dataset ≥ 65	3,185	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: Ambulatory care patients: 21%, Patients in the Kansas Frail Elderly Program :48% Older nursing home residents: 38%
Brown <i>et al.</i> '04 ^[148]	Observational	US	US	Hospital ≥ 65	99	1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence rate: 10.1%
Curtis <i>et al.</i> '04 ^[149]	Observational	US	US	Community dwelling ≥ 65	765,423	Modified 1997 Beers' ID criteria	Modified 1997 Beers' criteria PIP prevalence rate: 21.2%
Fillenbaum <i>et al.</i> '04 ^[150]	Observational	US	US	Community dwelling ≥ 68	3,165	2002 DUR criteria 1997 Beers' ID criteria	2002 DUR PIP prevalence: 21.3% 1997 Beers' ID criteria PIP prevalence: 27.9%
Caterino <i>et al.</i> '04 ^[151]	Observational	US	US	Hospital ≥ 65	33,395	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: 12.6%
Lau <i>et al.</i> '04 ^[152]	Observational	US	US	Long term care ≥ 65	3,372	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 50%
Chang <i>et al.</i> '04 ^[153]	Observational	Taiwan	Asia	Community dwelling ≥ 65	882	1997 Beers' criteria	1997 Beers' PIP prevalence: 10.5%
Goulding <i>et al.</i> '04 ^[154]	Observational	US	US	Hospital ≥ 65	22,031	Modified 1997 Beers' ID criteria Modified 2001 Zhan criteria	Modified 1997 Beers' criteria PIP prevalence: 7.6-7.8% Modified 2001 Zhan criteria PIP prevalence: 3.7-3.8
Hanlon <i>et al.</i> '04 ^[155]	Observational	US	US	Hospital ≥ 65	397	Modified 1992 MAI (≥ 1 medications with MAI criteria rated as inappropriate)	Modified 1992 MAI PIP prevalence: 91.9%
Rancourt <i>et al.</i> '04 ^[156]	Observational	Canada	Canada	Long term care ≥ 65	2,633	2004 Rancourt et al. consensus criteria (largely based on the Beers' and the McLeod criteria)	2004 Rancourt consensus criteria PIP prevalence: 54.7%
Rhoads <i>et al.</i> '03 ^[157]	Intervention	US	US	Long term care ≥ 65	456	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: 31.6%
Gray <i>et al.</i> '03 ^[158]	Observational	US	US	Long term care ≥ 65	282	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: Baseline: 22% Over a one year period: 43.7%
Heininger-Rothbucher <i>et al.</i> '03 ^[159]	Observational	Austria	Europe	Hospital ≥ 60	195	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 12.3%
Onder <i>et al.</i> '03 ^[160]	Observational	Italy	Europe	Hospital ≥ 65	5,734	Modified 1997 Beers' ID criteria	1997 Beers' PIP prevalence: 14.6%
Stuart <i>et al.</i> '03 ^[161]	Observational	US	US	Community dwelling ≥ 65	20244	Modified 1997 Beers' ID criteria	1997 Beers' Criteria PIP prevalence: 1995 CD: 24.8% 1995 DMB: 31.1% 1999 CD: 21.3% 1999 DMB: 31.5%
Edwards <i>et al.</i> '03 ^[162]	Observational	US	US	Hospital ≥ 65	349	1997 Beers' criteria	1997 Beers' criteria high severity PIP prevalence: 11.1-12.7%

							ACE unit: 11.1% General medicine:12.7%
Pitkala <i>et al.</i> '02 ^[163]	Observational	Finland	Europe	Mixed dataset ≥ 65	2,511	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 12.5%
Dhall <i>et al.</i> '02 ^[164]	Observational	US	US	Long term care ≥ 65	44,562	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: Admission: 33% After 90 days: 31%
Hanlon <i>et al.</i> '02 ^[165]	Observational	US	US	Community dwelling ≥ 65	5,742	2002 DUR criteria	2002 DUR criteria PIP prevalence: 19.2-21.0% 1990: 21.0% 1993: 19.2%
Hanlon <i>et al.</i> '02 ^[166]	Observational	US	US	Community dwelling ≥ 65	2,451	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: 28%
Dhalla <i>et al.</i> '02 ^[167]	Observational	US	US	Long term care ≥ 65	19,911	Modified 1997 Beers' ID criteria	1997 Beers' PIP prevalence: At admission: 25.4% At discharge: 20.8%
Sloane <i>et al.</i> '02 ^[168]	Observational	US	US	Long term care ≥ 65	2,014	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: 16.0%
Spiker <i>et al.</i> '01 ^[169]	Intervention	US	US	Community dwelling ≥ 65	146	Modified 1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 35.6%
Gill <i>et al.</i> '01 ^[170]	Intervention	Canada	Canada	Long term care ≥ 65	355	2000 IPET	2000 IPET PIP prevalence: 18.3%
Zhan <i>et al.</i> '01 ^[171]	Observational	US	US	Community dwelling ≥ 65	100	2001 Zhan criteria	2001 Zhan criteria PIP prevalence: 21.3%
Piecoro <i>et al.</i> '00 ^[172]	Observational	US	US	Mixed dataset ≥ 65	64,832	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: Combined: 27% Nursing home elders: 33.2% Community dwelling elders: 24.4%
Naugler <i>et al.</i> '00 ^[173]	Observational	Canada	Canada	Hospital ≥ 70	361	2000 IPET	2000 IPET PIP prevalence rate:12.5%
Chin <i>et al.</i> '99 ^[174]	Observational	US	US	Community dwelling ≥ 65	898	Modified 1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 14.8%
Golden <i>et al.</i> '99 ^[175]	Observational	US	US	Community dwelling ≥ 60	2,193	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: 39.7%
Lunn <i>et al.</i> '97 ^[176]	Observational	UK	Europe	Long term care ≥ 60	101	1997 Lunn consensus PIP criteria	1997 Lunn consensus criteria PIP prevalence: 53%
Anderson <i>et al.</i> '97 ^[177]	Observational	Canada	Canada	Community dwelling ≥ 65	355,600	Modified 1991 Beers' criteria	Modified 1991 Beers' criteria PIP prevalence: 22%
Wilcox <i>et al.</i> '94 ^[178]	Observational	US	US	Community dwelling ≥ 65	6,171	Modified 1991 Beers' criteria	Modified 1991 Beers' criteria PIP prevalence: 28.7%
Stuck <i>et al.</i> '94 ^[179]	Observational	US	US	Community dwelling ≥ 75	414	Modified 1991 Beers' criteria	Modified 1991 Beers' criteria PIP prevalence: 14%
Beers <i>et al.</i> '92 ^[180]	Observational	US	US	Long term care ≥ 65	1,106	1991 Beers' Criteria	1991 Beers' Criteria PIP prevalence: 40.3%

Setting of care

- Primary care: Community dwelling
- Secondary care: Hospital setting
- Long term care: Nursing homes or long term tertiary hospitals
- Mixed datasets: Sample is from different care settings

Primary Care

Table 2.4. Summary table of all primary care studies

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Bradley <i>et al.</i> '12 ^[5]	Observational	Northern Ireland	Europe	Community dwelling ≥70	166,108	Modified 2008 STOPP criteria	Modified 2008 STOPP criteria PIP prevalence: 34.0%
Nyborg <i>et al.</i> '12 ^[6]	Observational	Norway	Europe	Community dwelling ≥70	445,900	2009 NORGE criteria	2009 NORGE criteria PIP prevalence: 34.8%
Oliveira <i>et al.</i> '12 ^[7]	Observational	Brazil	South America	Community dwelling ≥60	139	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 34.5%
Amann <i>et al.</i> '12 ^[16]	Observational	Germany	Europe	Community dwelling ≥65	804,400	2010 PRISCUS List	2010 PRISCUS List PIP prevalence: 25.0-28.3%
Goltz <i>et al.</i> '11 ^[20]	Observational	Germany	Europe	Community dwelling ≥65	2003-12,513,584 2004-10,126,809	Modified 2003 Beers' criteria	Modified 2003 Beers' criteria PIP prevalence: 2003: 21.7% 2004: 18.2%
Pugh <i>et al.</i> '11 ^[21]	Observational	US	US	Community dwelling ≥65	1,567,467	2006 HEDIS criteria (HRME)	2006 HEDIS criteria PIP prevalence: 2004: 13.1% 2005: 12.8% 2006: 12.3%
Dunn <i>et al.</i> '11 ^[25]	Intervention	US	US	Community dwelling ≥65	120	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 37.5%
Bao <i>et al.</i> '11 ^[26]	Observational	US	US	Community dwelling ≥65	3,124	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 38%
Lund <i>et al.</i> '11 ^[27]	Intervention	US	US	Community dwelling ≥65	407	1997 Beers' criteria 2003 Beers' criteria	1997 Beers' criteria PIP prevalence in the PCM patients: 31.1% 2003 Beers' criteria PIP prevalence in the EPOC patients: 44.2%
Lin <i>et al.</i> '11 ^[28]	Observational	Taiwan	Asia	Community dwelling ≥65	327	Modified 2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 5% (90/327)
Leikola <i>et al.</i> '11 ^[30]	Observational	Finland	Europe	Community dwelling ≥65	841,509	Modified Finnish 2003 Beers' ID criteria	Modified Finnish 2003 Beers' ID criteria PIP Prevalence:14.7% (n=123545)
Mandavi <i>et al.</i> '11 ^[33]	Observational	India	Asia	Community dwelling ≥60	1,081	Modified 2003 Beers' criteria	2003 Beers' PIP prevalence:10.8%
Pugh <i>et al.</i> '11 ^[35]	Observational	US	US	Community dwelling ≥65	305,041	Modified 2006 HEDIS criteria	Modified 2006 HEDIS criteria PIP prevalence: 15.2%
Ghadimi <i>et al.</i> '11 ^[40]	Observational	Iran	Asia	Community dwelling ≥65	2,041	Modified 2003 Beers' ID criteria.	Modified 2003 Beers' ID PIP prevalence: 30% (27% for men; 33% for women).
Fiss <i>et al.</i> '11 ^[42]	Observational	Germany	Europe	Community dwelling ≥65	744	Modified German 2003 Beers' criteria	Modified German 2003 Beers' criteria PIP prevalence: 18%
Golden <i>et al.</i> '11 ^[45]	Observational	US	US	Community dwelling ≥65	3,911	Modified 2003 Beers' ID criteria (high risk medications)	Modified 2003 Beers ID criteria PIP rate: 25.2%
Albert <i>et al.</i> '10 ^[46]	Observational	US	US	Community dwelling	7,459	Modified 2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 53.5%

				≥65		2006 HEDIS criteria	2006 HEDIS PIP prevalence: 38.8%
Shiyanbola <i>et al.</i> '10 ^[47]	Observational	US	US	Community dwelling ≥65	874	2003 Beers' criteria Modified 2001 ACOVE criteria	2003 Beers' criteria PIP prevalence: 26.5% Modified 2001 ACOVE criteria PIP prevalence: 34.7% Combined criteria PIP prevalence: 45.8%
Lau <i>et al.</i> '10 ^[48]	Observational	US	US	Community dwelling ≥65	4,087	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 17% overall 15% in patients with dementia 20% in patients without dementia
Fu <i>et al.</i> '10 ^[49]	Observational	US	US	Community dwelling ≥65	1,774	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 2005: 20% 2006: 16%
Akazawa <i>et al.</i> '10 ^[50]	Observational	Japan	Asia	Community dwelling ≥65	6,628	Modified Japanese 2003 Beers' ID criteria	Modified Japanese 2003 Beers' criteria PIP prevalence: 43.6%
Maio <i>et al.</i> '10 ^[56]	Observational	Italy	Europe	Community dwelling ≥65	91,741	Modified 2003 Beers' ID criteria	2003 Beers ID criteria PIP prevalence: 25.8%
Pozzi <i>et al.</i> '10 ^[59]	Observational	Italy	Europe	Community dwelling ≥65	1,022	Modified 1991 Beers' criteria	1991 Beers' criteria PIP prevalence: 9%
Lund <i>et al.</i> '10 ^[61]	Observational	US	US	Community dwelling ≥65	240	2003 Beers' criteria 1992 MAI	2003 Beers' criteria PIP prevalence : 48.7% 1992 MAI prevalence: 54.3%
Castelino <i>et al.</i> '10 ^[62]	Observational	Australia	Australia	Community dwelling ≥65	372	2003 Beers' criteria 2007 DBI	2003 Beers' criteria prevalence: 39.8% 2007 DBI PIP prevalence: 60.5%
Cahir <i>et al.</i> '10 ^[64]	Observational	Ireland	Europe	Community dwelling ≥70	338,801	Modified 2008 STOPP criteria	Modified STOPP criteria PIP prevalence: 36% (121 454 claimants)
Berdot <i>et al.</i> '09 ^[71]	Observational	France	Europe	Community dwelling ≥65	6,343	Combined criteria (Modified 1997 Beers' ID criteria and modified 2003 Beers' ID criteria and La Roche criteria)	Combined criteria PIP prevalence: 31.6%
Ryan <i>et al.</i> '09 ^[73]	Observational	Ireland	Europe	Community dwelling ≥65	1,329	2003 Beers' criteria 2008 STOPP criteria 2008 START criteria	2003 Beers' criteria PIP prevalence: 18.3% 2008 STOPP criteria PIP prevalence: 21.4% 2008 START criteria PPO prevalence: 22.7%
Bongue <i>et al.</i> '09 ^[74]	Observational	France	Europe	Community dwelling ≥65	30,683	Modified 1997 Beers' ID criteria 2001 French list of PIP criteria (Based on the 1997 Beers' ID	Modified 1997 Beers' ID criteria PIP prevalence rate: 10.1% 2001 French list of PIP criteria prevalence rate : 25.4%

						criteria)	
Lapi <i>et al.</i> '09 ^[75]	Observational	Italy	Europe	Community dwelling ≥65	568	Modified 1991 Beers' criteria	Modified 1991 Beers' criteria PIP prevalence: 9.1%
Ryan <i>et al.</i> '09 ^[76]	Observational	Ireland	Europe	Community dwelling ≥65	500	2003 Beers' criteria 2000 IPET criteria	2003 Beers' criteria PIP prevalence: 13% 2000 IPET criteria PIP prevalence: 10.4%
Steinman <i>et al.</i> '09 ^[78]	Observational	US	US	Community dwelling ≥65	256	2003 Beers' criteria 2001 Zhan criteria	2003 Beers' criteria PIP prevalence: 53% 2001 Zhan criteria PIP prevalence: 28%
Buck <i>et al.</i> '09 ^[79]	Observational	US	US	Community dwelling ≥65	61,251	2003 Beers' ID criteria 2001 Zhan criteria.	2003 Beers' ID criteria PIP prevalence: Centre 1: 8693 (23.3%) Centre 2: 5528 (23.0%) 2001 Zhan criteria PIP prevalence: Centre 1: 6036 (16.2%) Centre 2: 4160 (17.3%)
Carey <i>et al.</i> '08 ^[86]	Observational	UK	Europe	Community dwelling ≥65	218,567	Modified 2003 Beers' criteria	2003 Beers' PIP prevalence: 1996: 32.2% 2005:28.3%
Rajska-Neumann <i>et al.</i> '07 ^[96]	Observational	Poland	Europe	Community dwelling ≥65	1,000	1997 Beers' ID criteria	1997 Beers' ID criteria PIP prevalence: Overall: 28.3 Poznan: 28.6% Glogow: 27.2%
Rossi <i>et al.</i> '07 ^[97]	Observational	US	US	Community dwelling ≥60	128	Modified 1992 MAI criteria (unnecessary drug use)	Modified 1992 MAI unnecessary medication prevalence: 58.6%
Fick <i>et al.</i> '07 ^[98]	Observational	US	US	Community dwelling ≥65	17,971	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 40.7%
Steinman <i>et al.</i> '07 ^[102]	Observational	US	US	Community dwelling ≥65	196	2003 Beers' criteria 1992 MAI	2003 Beers' criteria PIP prevalence: 37% 1992 MAI PIP prevalence: 82%
Landi <i>et al.</i> '07 ^[104]	Observational	Italy	Europe	Community dwelling ≥80	364	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 26%
Bregnhøj <i>et al.</i> '07 ^[105]	Observational	Denmark	Europe	Community dwelling >65	212	MAI	1992 MAI PIP prevalence: 94.3%
Roughead <i>et al.</i> '07 ^[106]	Observational	Australia	Australia	Community Dwelling ≥70	192,363	Combined criteria (Modified 2003 Beers' ID criteria and modified 1997 McLeod criteria)	Combined criteria PIP prevalence: 21.2%
Fahlman <i>et al.</i> '07 ^[108]	Observational	US	US	Community dwelling ≥65	4,602	1997 Beers' ID criteria	1997 Beers' ID criteria PIP prevalence: 44%
Bierman <i>et al.</i> '07 ^[109]	Observational	US	US	Community dwelling ≥65	965,756	Modified 2001 Zhan criteria	Modified 2001 Zhan criteria PIP prevalence: Men: 25.7% Women: 31%

Fu <i>et al.</i> '07 ^[110]	Observational	US	US	Community dwelling ≥65	720	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 15.97%
De Oliveira Martins <i>et al.</i> '06 ^[112]	Observational	Portugal	Europe	Community dwelling ≥65	213	1997 Beers' ID criteria 2003 Beers' ID criteria	1997 Beers' criteria PIP prevalence: 27.7% 2003 Beers' criteria PIP prevalence: 38.5%
Franic <i>et al.</i> '06 ^[113]	Observational	US	US	Community dwelling ≥65	444	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 16.7%
Saab <i>et al.</i> '06 ^[115]	Observational	Lebanon	Asia	Community dwelling ≥65	350	2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 22.4%
Steinman <i>et al.</i> '06 ^[122]	Observational	US	US	Community dwelling ≥65	196	2003 Beers' criteria 1999 AOU criteria Modified 1992 MAI criteria (unnecessary drug use)	Modified 1992 MAI PIP prevalence: 57% 2003 Beers' criteria PIP prevalence: 37% 1999 AOU criteria PPO prevalence: 64%
Barnett <i>et al.</i> '06 ^[124]	Observational	US	US	Community dwelling ≥65	281150	2001 Zhan criteria	2001 Zhan criteria PIP prevalence: Veterans Administration: 21.3% Health maintenance organization: 28.8%
Maio <i>et al.</i> '06 ^[125]	Observational	US	US	Community dwelling ≥65	100	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: Family Practice: 22% Senior citizens centre: 26%
Ay <i>et al.</i> '05 ^[127]	Observational	Turkey	Asia	Community dwelling ≥70	1,019	Modified Turkish 1997 Beers' ID criteria	Modified Turkish 1997 Beers' ID criteria PIP prevalence: 9.8%
Lechevallier-Michel <i>et al.</i> '05 ^[130]	Observational	France	Europe	Community dwelling ≥65	9,294	2001 French list of PIP criteria (Based on the 1997 Beers' ID criteria)	2001 French PIP criteria prevalence: 38.7%
Roth <i>et al.</i> '05 ^[131]	Observational	US	US	Community dwelling ≥60	100	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 34%
Azoulay <i>et al.</i> '05 ^[132]	Observational	Iran	Asia	Community dwelling ≥65	3,000	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: 27.6%
Chang <i>et al.</i> '05 ^[142]	Observational	US	US	Community dwelling ≥65	550	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 11.6%
Fialova <i>et al.</i> '05 ^[143]	Observational	Europe- Metropolit an areas of the Czech Republic, Denmark, Finland, Iceland, Italy, the Netherlan ds,	Europe	Community dwelling ≥65	2,707	Modified 1997 Beers' ID criteria Modified 2003 Beers' ID criteria Modified 1997 McLeod criteria	Overall: Combination of all 3 tools PIP prevalence rate: 19.8 Modified 1997 Beers' ID criteria PIP prevalence: 3.3-17.1% Modified 2003 Beers' ID criteria PIP prevalence: 5.8-25.2% Modified 1997 McLeod criteria PIP prevalence: 3.0-31.8%

		Norway, and the United Kingdom.					
Howard <i>et al.</i> '04 ^[144]	Observational	Canada	Canada	Community dwelling ≥65	777	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence:16.3%
Curtis <i>et al.</i> '04 ^[149]	Observational	US	US	Community dwelling ≥65	765,423	Modified 1997 Beers' ID criteria	Modified 1997 Beers' criteria PIP prevalence rate: 21.2%
Fillenbaum <i>et al.</i> '04 ^[150]	Observational	US	US	Community dwelling ≥68	3,165	2002 DUR criteria 1997 Beers' ID criteria	2002 DUR PIP prevalence: 21.3% 1997 Beers' ID criteria PIP prevalence: 27.9%
Chang <i>et al.</i> '04 ^[153]	Observational	Taiwan	Asia	Community dwelling ≥65	882	1997 Beers' criteria	1997 Beers' PIP prevalence: 10.5%
Stuart <i>et al.</i> '03 ^[161]	Observational	US	US	Community dwelling ≥65	20244	Modified 1997 Beers' ID criteria	1997 Beers' Criteria PIP prevalence: 1995 CD: 24.8% 1995 DMB: 31.1% 1999 CD: 21.3% 1999 DMB: 31.5%
Hanlon <i>et al.</i> '02 ^[165]	Observational	US	US	Community dwelling ≥65	5,742	2002 DUR criteria	2002 DUR criteria PIP prevalence: 19.2-21.0% 1990: 21.0% 1993: 19.2%
Hanlon <i>et al.</i> '02 ^[166]	Observational	US	US	Community dwelling ≥65	2,451	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: 28%
Spiker <i>et al.</i> '01 ^[169]	Intervention	US	US	Community dwelling ≥65	146	Modified 1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 35.6%
Zhan <i>et al.</i> '01 ^[171]	Observational	US	US	Community dwelling ≥65	100	2001 Zhan criteria	2001 Zhan criteria PIP prevalence: 21.3%
Chin <i>et al.</i> '99 ^[174]	Observational	US	US	Community dwelling ≥65	898	Modified 1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 14.8%
Golden <i>et al.</i> '99 ^[175]	Observational	US	US	Community dwelling ≥60	2,193	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: 39.7%
Anderson <i>et al.</i> '97 ^[177]	Observational	Canada	Canada	Community dwelling ≥65	355,600	Modified 1991 Beers' criteria	Modified 1991 Beers' criteria PIP prevalence: 22%
Wilcox <i>et al.</i> '94 ^[178]	Observational	US	US	Community dwelling ≥65	6,171	Modified 1991 Beers' criteria	Modified 1991 Beers' criteria PIP prevalence: 28.7%
Stuck <i>et al.</i> '94 ^[179]	Observational	US	US	Community dwelling ≥75	414	Modified 1991 Beers' criteria	Modified 1991 Beers' criteria PIP prevalence: 14%

Secondary Care

Table 2.5. Summary table of all secondary care studies

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Vishwas <i>et al.</i> '12 ^[2]	Observational	India	Asia	Hospital ≥60	540	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 13.3% 2003 Beers' criteria PIP prevalence: 24.6%
Yasein <i>et al.</i> '12 ^[8]	Observational	Jordan	Asia	Hospital ≥65	400	2003 Beers' criteria	2003 Beers' ID criteria PIP prevalence: 29.5% 2003 Beers' CD criteria PIP prevalence: 7.0%
Dalleur <i>et al.</i> '12 ^[12]	Observational	Belgium	Europe	Hospital ≥75	302	2008 STOPP criteria 2008 START criteria	2008 STOPP PIP prevalence: 48.0%. 2008 START PPO prevalence: 63.0%..
Wahab <i>et al.</i> '12 ^[14]	Observational	Australia	Australia	Hospital ≥65	100	2008 STOPP criteria	2008 STOPP PIP prevalence: 60.0%.
Al-Omar <i>et al.</i> '12 ^[15]	Observational	Saudi Arabia	Asia	Hospital ≥65	2,052	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 29.5%
Fouquet <i>et al.</i> '12 ^[17]	Observational	France	Europe	Hospital ≥75	150	2003 French modified Beers' criteria 2000 Modified IPET criteria	Combined criteria PIP prevalence: 26.7% 2003 French modified Beers' criteria PIP prevalence: 24.0%. 2000 Modified IPET criteria PIP prevalence: 9.3%.
Borges <i>et al.</i> '11 ^[19]	Observational	Portugal	Europe	Hospital ≥65	105	2008 START criteria	2008 START criteria PPO prevalence: 41.9%.
Gopinath <i>et al.</i> '11 ^[23]	Observational	India	Asia	Hospital ≥65	170	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 45.3 %
Widagdo <i>et al.</i> '11 ^[24]	Observational	Australia	Australia	Hospital ≥65	100	2003 Beers' criteria (high severity)	2003 Beers' criteria PIP prevalence: Admission: 42% Discharge: 39%
Woelfel <i>et al.</i> '11 ^[29]	Observational	US	US	Hospital ≥65	295	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 18%
Gallagher <i>et al.</i> '11 ^[34]	Observational	Europe	Europe	Hospital ≥65	900	2008 STOPP criteria 2008 START criteria 2003 Beers' criteria	Overall 2008 STOPP PIM prevalence was 51.3%. Ranging from 34.7- 77.3% Overall 2003 Beers' PIP prevalence was 30.4%. Ranging from 22.7-43.3%. Overall 2008 START PPO prevalence was 59.4%. Ranging from 51.3- 72.7%.
Luo <i>et al.</i> '11 ^[36]	Observational	Northern Ireland	Europe	Hospital ≥65	192	2003 Beers' criteria 2000 IPET 2006 HEDIS criteria	2003 Beers' criteria PIP prevalence: 25.1-30.7% 2000 IPET PIP prevalence: 19-27.4% 2006 HEDIS PIP prevalence: 5.6-9.7%
Liu <i>et al.</i> '11 ^[37]	Observational	Taiwan	Asia	Hospital ≥65	520	2008 STOPP criteria	2008 STOPP criteria PIP prevalence: 36.2%

						2008 START criteria	2008 START criteria PPO prevalence: 41.9%.
Gallagher <i>et al.</i> '11 ^[38]	Intervention	Ireland	Europe	Hospital ≥ 65	400	2008 STOPP criteria 2008 START criteria 1992 MAI 1999 AOU criteria	2008 combined STOPP and START criteria combined prevalence: 58.4% 1992 MAI prevalence: 48% 1999 AOU criteria prevalence: 37%
Lang <i>et al.</i> '11 ^[39]	Intervention	Switzerland	Europe	Hospital ≥ 65	134	2008 STOPP criteria (French adaption) 2008 START criteria (French adaption)	2008 STOPP criteria PIP prevalence: Admission: 77.3% Discharge: 18.6% 2008 START criteria PPO prevalence: Admission: 64.7% Discharge: 11.2%
Sakuma <i>et al.</i> '11 ^[41]	Observational	Japan	Asia	Hospital ≥ 65	2,155	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 56.1%
Shah <i>et al.</i> '11 ^[43]	Observational	India	Asia	Hospital ≥ 65	400	2003 Beers' criteria 1998 Phadke's criteria of rationale prescribing	2003 Beers' criteria PIP prevalence: 27.25% 1998 Phadke's criteria of irrational prescribing prevalence: 28.3%
Hamilton <i>et al.</i> '11 ^[44]	Observational	Ireland	Europe	Hospital ≥ 65	600	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 56.2% 2003 Beers' criteria PIP prevalence: 28.8%
Somers <i>et al.</i> '10 ^[51]	Observational	Belgium	Europe	Hospital ≥ 65	110	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: Admission: 20% Discharge: 16%
Harugeri <i>et al.</i> '10 ^[52]	Observational	India	Asia	Hospital ≥ 60	814	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 23.5%
Zaveri <i>et al.</i> '10 ^[54]	Observational	India	Asia	Hospital ≥ 65	407	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 23.59%
Kamuhabwa <i>et al.</i> '10 ^[55]	Observational	Tanzania	Africa	Hospital ≥ 65	514	Modified 2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 11.4%
Pyszka <i>et al.</i> '10 ^[60]	Observational	US	US	Hospital ≥ 70	111	Modified 2008 STOPP criteria 2008 START criteria	Modified 2008 STOPP criteria PIP prevalence: 65% at admission 64% at discharge 64% at follow-up 2008 START criteria PPO prevalence: 52% at admission 40% at discharge 35% at follow-up
Lang <i>et al.</i> '10 ^[63]	Observational	Switzerland	Europe	Hospital ≥ 65	150	2008 STOPP criteria (French adaption) 2008 START criteria (French adaption)	2008 STOPP criteria PIP prevalence: 77% START PPO RATE: 65%.

Pattanworasate <i>et al.</i> '10 ^[65]						Modified Australian 2003 Beers' criteria Modified Australian 1997 McLeod criteria Modified 2006 NPS criteria	Combined criteria PIP prevalence: 55% Modified Australian 2003 Beers' criteria PIP prevalence: 44% Modified Australian 1997 McLeod criteria PIP prevalence: 41% Modified 2006 NPS criteria PIP prevalence: 16%
Wright <i>et al.</i> '09 ^[67]	Observational	Australia	Australia	Hospital ≥65	202	1999 AOU criteria	1999 AOU criteria PPO prevalence: 62%
Bergkvist <i>et al.</i> '09 ^[69]	Intervention	Sweden	Europe	Hospital ≥65	53	1992 MAI	1992 MAI PIP prevalence: Admission: Controls: 96% Intervention: 86% Discharge: Controls: 96% Intervention: 79%
Corsonello <i>et al.</i> '09 ^[70]	Observational	Italy	Europe	Hospital ≥65	506	2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 20.6%
Chen <i>et al.</i> '09 ^[72]	Observational	Taiwan	Asia	Hospital ≥65	1,429,463	Modified 2003 Beers' ID criteria	2003 Beers' PIP prevalence: 14.7%
Lai <i>et al.</i> '09 ^[77]	Observational	Taiwan	Asia	Hospital ≥65	8,213,147	Modified Taiwanese 2003 Beers' ID criteria	Modified Taiwanese 2003 Beers' ID PIP prevalence: 63.8% over the study period.
Mansur <i>et al.</i> '09 ^[80]	Observational	Israel	Asia	Hospital ≥65	212	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: At admission: 43.5% At discharge: 44.4%
Hale <i>et al.</i> '08 ^[81]	Observational	US	US	Hospital ≥65	100	2003 Beers' criteria	2003 Beers' criteria PIP prevalence Before admission: 39% During hospitalization: 59% At discharge: 41%
Wawruch <i>et al.</i> '08 ^[82]	Observational	Slovakia	Europe	Hospital ≥65	600	Modified 2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 21%
Prudent <i>et al.</i> '08 ^[83]	Observational	France	Europe	Hospital ≥75	1,176	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 28.2%
Gallagher <i>et al.</i> '08 ^[84]	Observational	Ireland	Europe	Hospital ≥65	715	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 35% 2003 Beers' criteria PIP prevalence: 25%
Schuler <i>et al.</i> '08 ^[85]	Observational	Austria	Europe	Hospital ≥75	543	Modified 2003 Beers' criteria	Modified 2003 Beers' criteria PIP prevalence: 30.1%
Radozevic <i>et al.</i> '08 ^[88]	Observational	Croatia	Europe	Hospital ≥65	225	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence rate: 22%
Lin <i>et al.</i> '08 ^[90]	Observational	Taiwan	Asia	Hospital ≥65	5,741	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 23.7%

Gallagher <i>et al.</i> '08 ^[91]	Observational	Ireland	Europe	Hospital ≥ 65	597	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 32%
Rothberg <i>et al.</i> '08 ^[92]	Observational	US	US	Hospital ≥ 65	493,971	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 49% (ranged from 34-55%)
Budnitz <i>et al.</i> '07 ^[93]	Observational	US	US	Hospital ≥ 65	177,504	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 10.5%
Spinewine <i>et al.</i> '07 ^[94]	Intervention	Belgium	Europe	Hospital ≥ 70	203	Modified 1997 Beers' ID criteria 1992 MAI 2001 ACOVE criteria	1997 Beers' PIP prevalence: 30% 1992 MAI PIP prevalence: 60% 2001 ACOVE criteria PIP prevalence: 78%
Barry <i>et al.</i> '07 ^[95]	Observational	Ireland	Europe	Hospital ≥ 65	600	2008 START criteria	2008 START criteria PPO prevalence: 57.8%
Nixdorff <i>et al.</i> '07 ^[99]	Observational	US	US	Hospital ≥ 65	124	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 29%
Mandavi <i>et al.</i> '07 ^[101]	Observational	India	Asia	Hospital ≥ 60	515	Modified 2003 Beers' Criteria	2003 Beers' criteria PIP prevalence: 17.9%
Hustey <i>et al.</i> '07 ^[103]	Observational	US	US	Hospital ≥ 65	352	2003 Beers' Criteria 2003	2003 Beers' criteria PIP prevalence: 32%
Cannon <i>et al.</i> '06 ^[111]	Observational	US	US	Hospital ≥ 65	786	Modified 1997 Beers' ID criteria	1997 Beers' PIP prevalence: 31%
Egger <i>et al.</i> '06 ^[117]	Observational	Switzerland	Europe	Hospital ≥ 65	800	Modified Swiss 2003 Beers' criteria	Modified Swiss 2003 Beers' criteria PIP prevalence: Medical ward: Admission: 16.0% Discharge: 13.3% Geriatric ward Admission: 20.8%, Discharge: 15.9%
Barry <i>et al.</i> '06 ^[118]	Observational	Ireland	Europe	Hospital ≥ 65	350	2003 Beers' criteria 2000 IPET	2003 Beers' PIP prevalence: 34.6% 2000 IPET PIP prevalence: 22%
Page <i>et al.</i> '06 ^[119]	Observational	US	US	Hospital ≥ 75	389	Modified 2003 Beers' ID criteria	2003 Beers' PIP prevalence: 27.5%
Wawruch <i>et al.</i> '06 ^[121]	Observational	Slovakia	Europe	Hospital ≥ 65	600	2003 Beers' criteria	2003 Beers' PIP prevalence: Admission: 20.2% Discharge: 20%
Laroche <i>et al.</i> '06 ^[126]	Observational	France	Europe	Hospital ≥ 70	2,018	2001 French list of PIP criteria (Based on the 1997 Beers' ID criteria)	2001 French PIP criteria prevalence: 66%
Hajjar <i>et al.</i> '05 ^[129]	Observational	US	US	Hospital ≥ 65	384	Modified 1992 MAI criteria (unnecessary drug use)	Modified 1992 MAI unnecessary drug use prevalence: 44%
Viswanathan <i>et al.</i> '05 ^[135]	Observational	US	US	Hospital ≥ 65	7,243	Modified 2003 Beers' ID criteria Modified 1997 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 13.4% Modified 1997 Beers' ID criteria PIP prevalence:

						Modified 2001 Zhan criteria	8.8%
							Modified Zhan criteria PIP prevalence: 4.2%
Saltvedt <i>et al.</i> '05 [137]	Intervention	Norway	Europe	Hospital ≥ 75	254	1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: Patients in a geriatric evaluation and management unit: 10% Patients in a general medical ward: 9%
Van der Hooft <i>et al.</i> '05 [138]	Observational	Netherlands	Europe	Hospital ≥ 65	120,218	1997 Beers' criteria 2003 Beers criteria	1997 Beers' criteria PIP prevalence: 16.8%-18.5% 2003 Beers' criteria PIP prevalence: 19.1%-20.0%
Onder <i>et al.</i> '05 [141]	Observational	US	US	Hospital ≥ 65	5,152	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 28.6%
Brown <i>et al.</i> '04 [148]	Observational	US	US	Hospital ≥ 65	99	1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence rate: 10.1%
Caterino <i>et al.</i> '04 [151]	Observational	US	US	Hospital ≥ 65	33,395	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: 12.6%
Goulding <i>et al.</i> '04 [154]	Observational	US	US	Hospital ≥ 65	22,031	Modified 1997 Beers' ID criteria Modified 2001 Zhan criteria	Modified 1997 Beers' criteria PIP prevalence: 7.6-7.8% Modified 2001 Zhan criteria PIP prevalence: 3.7-3.8
Hanlon <i>et al.</i> '04 [155]	Observational	US	US	Hospital ≥ 65	397	Modified 1992 MAI (≥ 1 medications with MAI criteria rated as inappropriate)	Modified 1992 MAI PIP prevalence: 91.9%
Heininger-Rothbucher <i>et al.</i> '03 [159]	Observational	Austria	Europe	Hospital ≥ 60	195	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 12.3%
Onder <i>et al.</i> '03 [160]	Observational	Italy	Europe	Hospital ≥ 65	5,734	Modified 1997 Beers' ID criteria	1997 Beers' PIP prevalence: 14.6%
Edwards <i>et al.</i> '03 [162]	Observational	US	US	Hospital ≥ 65	349	1997 Beers' criteria	1997 Beers' criteria high severity PIP prevalence: 11.1-12.7% ACE unit: 11.1% General medicine: 12.7%
Naugler <i>et al.</i> '00 [173]	Observational	Canada	Canada	Hospital ≥ 70	361	2000 IPET	2000 IPET PIP prevalence rate: 12.5%

Long Term Care

Table 2.6. Summary table of all long term care studies

	Study type	Country	Jurisdiction	Care setting /age category	No patients	Criteria	PIP Prevalence
O'Sullivan <i>et al.</i> '13 ^[1]	Observational	Ireland	Europe	Long term care ≥ 65	732	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 70.0% 2003 Beers' criteria PIP prevalence: 53.4%
Chen <i>et al.</i> '12 ^[3]	Observational	Malaysia	Asia	Long term care ≥ 65	211	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 23.7% 2003 Beers' criteria PIP prevalence: 32.7%
Garcia-Gollarte <i>et al.</i> '12 ^[9]	Observational	Spain	Europe	Long term care ≥ 65	100	2008 STOPP criteria 2008 START criteria 2006 Australian criteria	2008 STOPP PIP prevalence: 79.0%. 2006 Australian PIP prevalence: 95.0%. 2008 START PPO prevalence: 74.0%..
Ubeda <i>et al.</i> '12 ^[10]	Observational	Spain	Europe	Long term care ≥ 65	81	2008 STOPP criteria 2008 START criteria 2003 Beers' criteria	Combined criteria PIP prevalence: 64.0% 2008 STOPP PIP prevalence: 48.0%. 2003 Beers' criteria PIP prevalence: 25.0%. 2008 START PPO prevalence: 44.0%..
Ryan <i>et al.</i> '12 ^[11]	Observational	Ireland	Europe	Long term care ≥ 65	313	2008 STOPP criteria 2008 START criteria	2008 STOPP PIP prevalence: 59.8%. 2008 START PPO prevalence: 42.2%..
Parsons <i>et al.</i> '12 ^[13]	Observational	UK	Europe	Long term care ≥ 65	133	Modified 2008 STOPP criteria	Modified 2008 STOPP criteria PIP prevalence: Time point 1: 46.2% Time point 2: 40.9%
Kolzsch <i>et al.</i> '11 ^[22]	Observational	Germany	Europe	Long term care ≥ 65	8,685	Modified German 2007 La Roche criteria	2007 La Roche criteria PIP prevalence: 21.9%
Stafford <i>et al.</i> '11 ^[32]	Observational	Australia	Australia	Long term care ≥ 65	2,345	2003 Beers' criteria 1997 McLeod criteria	Combined criteria PIP prevalence: 43.8% 2003 Beers' criteria PIP prevalence: 35.3% 1997 McLeod criteria PIP prevalence: 18.7%
Blozik <i>et al.</i> '10 ^[53]	Intervention	Switzerland	Europe	Long term care ≥ 60	181	Modified Beers' 2003 ID criteria	2003 Beers' PIP rate: 14.5% pre-intervention and 2.8% post-in intervention
Ruggiero <i>et al.</i> '10 ^[58]	Observational	Italy	Europe	Long term care ≥ 65	1,716	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 48%
Dedhiya <i>et al.</i> '10 ^[66]	Observational	US	US	Long term care ≥ 65	7,594	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 42.1%.
Ruggiero <i>et al.</i> '09 ^[68]	Observational	Italy	Europe	Long term care ≥ 65	496	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 27.7%
Hosia-Randell <i>et al.</i> '08 ^[87]	Observational	Finland	Europe	Long term care ≥ 65	1,987	Modified 2003 Beers' ID criteria	2003 Beers' PIP prevalence: 34.9%
Bergman <i>et al.</i> '07	Observational	Sweden	Europe	Long term care ≥ 65	7,904	2008 Swedish quality indicators	2008 Swedish quality indicators PIP prevalence:

[100]						(incorporating elements of the 1997 Beers' ID criteria)	74%
Niwata <i>et al.</i> '06 [114]	Observational	Japan	Asia	Long term care ≥ 65	1,669	Modified 2003 Beers' criteria	Modified 2003 Beers' criteria PIP prevalence: 21.1%
Perri <i>et al.</i> '05 [128]	Observational	US	US	Long term care ≥ 65	1,117	1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence 46.5%
Lau <i>et al.</i> '05 [134]	Observational	US	US	Long term care ≥ 65	3,372	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 50.3%
Zuckerman <i>et al.</i> '05 [136]	Observational	US	US	Long term care ≥ 65	546	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: Before admission: Dementia: 20% Without dementia: 23% After admission: Before admission: Dementia: 19% Without dementia: 28%
Mamun <i>et al.</i> '04 [145]	Observational	Singapore	Asia	Long term care ≥ 65	454	Modified 1997 Beers' criteria	Modified 1997 Beers' criteria PIP prevalence: 70.04%
Lau <i>et al.</i> '04 [152]	Observational	US	US	Long term care ≥ 65	3,372	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 50%
Rancourt <i>et al.</i> '04 [156]	Observational	Canada	Canada	Long term care ≥ 65	2,633	2004 Rancourt et al. consensus criteria (largely based on the Beers' and the McLeod criteria)	2004 Rancourt consensus criteria PIP prevalence: 54.7%
Rhoads <i>et al.</i> '03 [157]	Intervention	US	US	Long term care ≥ 65	456	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: 31.6%
Gray <i>et al.</i> '03 [158]	Observational	US	US	Long term care ≥ 65	282	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: Baseline: 22% Over a one year period: 43.7%
Dhall <i>et al.</i> '02 [164]	Observational	US	US	Long term care ≥ 65	44,562	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: Admission: 33% After 90 days: 31%
Dhalla <i>et al.</i> '02 [167]	Observational	US	US	Long term care ≥ 65	19,911	Modified 1997 Beers' ID criteria	1997 Beers' PIP prevalence: At admission: 25.4% At discharge: 20.8%
Sloane <i>et al.</i> '02 [168]	Observational	US	US	Long term care ≥ 65	2,014	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: 16.0%
Gill <i>et al.</i> '01 [170]	Intervention	Canada	Canada	Long term care ≥ 65	355	2000 IPET	2000 IPET PIP prevalence: 18.3%
Lunn <i>et al.</i> '97 [176]	Observational	UK	Europe	Long term care ≥ 60	101	1997 Lunn consensus PIP criteria	1997 Lunn consensus criteria PIP prevalence: 53%
Beers <i>et al.</i> '92 [180]	Observational	US	US	Long term care ≥ 65	1,106	1991 Beers' Criteria	1991 Beers' Criteria PIP prevalence: 40.3%

Mixed Dataset

Table 2.7. Summary table of all studies in mixed datasets

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Bakken <i>et al.</i> '12 ^[4]	Observational	Norway	Europe	Mixed dataset ≥ 70	400	2009 NORGE criteria	<p>2009 NORGE criteria PIP prevalence:</p> <p>Overall: 24.1% at admission 34.8% at discharge</p> <p>Nursing Home 25.5% at admission 33.1% at discharge</p> <p>Medical Ward: 22.6% at admission 36.8% at discharge</p>
Shah <i>et al.</i> '12 ^[18]	Observational	UK	Europe	Mixed dataset ≥ 65	Nursing Home (NH)- 10, 387 Community dwelling (CD)- 403,259	Modified 2003 Beers' criteria	<p>Modified 2003 Beers' criteria PIP prevalence:</p> <p>Nursing Home: 33.0% Community dwelling: 21.4%</p>
Barnett <i>et al.</i> '11 ^[31]	Observational	UK	Europe	Mixed dataset ≥ 65	70,299	Modified UK 2003 Beers' ID criteria	<p>Modified UK 2003 Beers' ID criteria PIP prevalence:</p> <p>Community dwelling: 30.9% Long term care: 37.1%</p>
Conejos Miquel <i>et al.</i> '10 ^[57]	Observational	Spain	Europe	Mixed dataset ≥ 65	150	<p>2003 Beers' criteria 2008 STOPP criteria 2008 START criteria</p>	<p>Primary Care 2003 Beers' criteria PIP prevalence: 24% 2008 STOPP criteria PIP prevalence: 36% 2008 START criteria PIP prevalence: 28%</p> <p>Secondary Care 2003 Beers' criteria PIP prevalence: 26% 2008 STOPP criteria PIP prevalence: 54% 2008 START criteria PIP prevalence: 54%</p> <p>Nursing Home Care 2003 Beers' criteria PIP prevalence: 20% 2008 STOPP criteria PIP prevalence: 50% 2008 START criteria PIP prevalence: 46%</p>
Pugh <i>et al.</i> '08 ^[89]	Observational	US	US	Mixed dataset ≥ 65	850,154	2001 Zhan criteria	2001 Zhan criteria PIP prevalence: 26.2%
De Wilde <i>et al.</i> '07	Observational	UK	Europe	Mixed dataset ≥ 65	162,000	Modified 2003 Beers' criteria	2003 Beers' criteria PIP prevalence:

[107]							2003: 32.2% (20.5% on high risk medications) 1994: 32.9% (21.4% on high risk medications)
Raivio <i>et al.</i> '06 [116]	Observational	Finland	Europe	Mixed dataset ≥ 70	425	Modified Finnish 1997 Beers' ID criteria	Modified Finnish 1997 Beers' ID criteria PIP prevalence: 36.2%
Maio <i>et al.</i> '06 [120]	Observational	Italy	Europe	Mixed dataset ≥ 65	849,425	Modified 2003 Beers' ID criteria	2003 Beers' PIP prevalence: 18%
Pugh <i>et al.</i> '06 [123]	Observational	US	US	Mixed dataset ≥ 65	1,096,361	2006 HEDIS criteria	2006 HEDIS criteria PIP prevalence: 19.6%
Klarin <i>et al.</i> '05 [133]	Observational	Sweden	Europe	Mixed dataset ≥ 75	785	Combined criteria (Modified 1997 Beers' criteria and modified 1997 McLeod criteria)	Combined criteria PIP prevalence: 18.6%
Pugh <i>et al.</i> '05 [139]	Observational	US	US	Mixed dataset ≥ 65	1,265,434	Modified 2001 Zhan criteria (including 2003 Beers criteria relating to medications considered potentially inappropriate based on dose)	Modified 2001 Zhan criteria PIP prevalence: 23%
Rigler <i>et al.</i> '05 [140]	Observational	US	US	Mixed dataset ≥ 60	3,185	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: Ambulatory care patients: 21%, Patients in the Kansas Frail Elderly Program :48% Older nursing home residents: 38%
Chetty <i>et al.</i> '04 [146]	Observational	South Africa	Africa	Mixed dataset ≥ 65	6,410	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence rate: 30.0%
Rigler <i>et al.</i> '04 [147]	Observational	US	US	Mixed dataset ≥ 65	3,185	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: Ambulatory care patients: 21%, Patients in the Kansas Frail Elderly Program :48% Older nursing home residents: 38%
Pitkala <i>et al.</i> '02 [163]	Observational	Finland	Europe	Mixed dataset ≥ 65	2,511	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 12.5%
Piecoro <i>et al.</i> '00 [172]	Observational	US	US	Mixed dataset ≥ 65	64,832	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: Combined: 27% Nursing home elders: 33.2% Community dwelling elders: 24.4%

Jurisdiction

- United States (US)
- Europe
- Asia
- Canada
- Australia
- Africa

United States

Table 2.8. Summary table of all American studies

	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Pugh <i>et al.</i> '11 ^[21]	Observational	US	US	Community dwelling ≥65	1,567,467	2006 HEDIS criteria (HRME)	2006 HEDIS criteria PIP prevalence: 2004: 13.1% 2005: 12.8% 2006: 12.3%
Dunn <i>et al.</i> '11 ^[25]	Intervention	US	US	Community dwelling ≥65	120	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 37.5%
Bao <i>et al.</i> '11 ^[26]	Observational	US	US	Community dwelling ≥65	3,124	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 38%
Lund <i>et al.</i> '11 ^[27]	Intervention	US	US	Community dwelling ≥65	407	1997 Beers' criteria 2003 Beers' criteria	1997 Beers' criteria PIP prevalence in the PCM patients: 31.1% 2003 Beers' criteria PIP prevalence in the EPOC patients: 44.2%
Woelfel <i>et al.</i> '11 ^[29]	Observational	US	US	Hospital ≥65	295	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 18%
Pugh <i>et al.</i> '11 ^[35]	Observational	US	US	Community dwelling ≥65	305,041	Modified 2006 HEDIS criteria	Modified 2006 HEDIS criteria PIP prevalence: 15.2%
Golden <i>et al.</i> '11 ^[45]	Observational	US	US	Community dwelling ≥65	3,911	Modified 2003 Beers' ID criteria (high risk medications)	Modified 2003 Beers ID criteria PIP rate: 25.2%
Albert <i>et al.</i> '10 ^[46]	Observational	US	US	Community dwelling ≥65	7,459	Modified 2003 Beers' criteria 2006 HEDIS criteria	2003 Beers' criteria PIP prevalence: 53.5% 2006 HEDIS PIP prevalence: 38.8%
Shiyanbola <i>et al.</i> '10 ^[47]	Observational	US	US	Community dwelling ≥65	874	2003 Beers' criteria Modified 2001 ACOVE criteria	2003 Beers' criteria PIP prevalence: 26.5% Modified 2001 ACOVE criteria PIP prevalence: 34.7% Combined criteria PIP prevalence: 45.8%
Lau <i>et al.</i> '10 ^[48]	Observational	US	US	Community dwelling ≥65	4,087	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 17% overall 15% in patients with dementia 20% in patients without dementia
Fu <i>et al.</i> '10 ^[49]	Observational	US	US	Community dwelling ≥65	1,774	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 2005: 20% 2006: 16%
Pyszka <i>et al.</i> '10 ^[60]	Observational	US	US	Hospital ≥70	111	Modified 2008 STOPP criteria 2008 START criteria	Modified 2008 STOPP criteria PIP prevalence: 65% at admission 64% at discharge 64% at follow-up 2008 START criteria PPO prevalence:

							52% at admission 40% at discharge 35% at follow-up
Lund <i>et al.</i> '10 ^[61]	Observational	US	US	Community dwelling ≥65	240	2003 Beers' criteria 1992 MAI	2003 Beers' criteria PIP prevalence : 48.7% 1992 MAI prevalence: 54.3%
Dedhiya <i>et al.</i> '10 ^[66]	Observational	US	US	Long term care ≥65	7,594	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 42.1%.
Wright <i>et al.</i> '09 ^[67]	Observational	US	US	Hospital ≥65	384	1999 AOU criteria	1999 AOU criteria PPO prevalence: 62%
Steinman <i>et al.</i> '09 ^[78]	Observational	US	US	Community dwelling ≥65	256	2003 Beers' criteria 2001 Zhan criteria	2003 Beers' criteria PIP prevalence: 53% 2001 Zhan criteria PIP prevalence: 28%
Buck <i>et al.</i> '09 ^[79]	Observational	US	US	Community dwelling ≥65	61,251	2003 Beers' ID criteria 2001 Zhan criteria.	2003 Beers' ID criteria PIP prevalence: Centre 1: 8693 (23.3%) Centre 2: 5528 (23.0%) 2001 Zhan criteria PIP prevalence: Centre 1: 6036 (16.2%) Centre 2: 4160 (17.3%)
Hale <i>et al.</i> '08 ^[81]	Observational	US	US	Hospital ≥65	100	2003 Beers' criteria	2003 Beers' criteria PIP prevalence Before admission: 39% During hospitalization: 59% At discharge: 41%
Pugh <i>et al.</i> '08 ^[89]	Observational	US	US	Mixed dataset ≥65	850,154	2001 Zhan criteria	2001 Zhan criteria PIP prevalence: 26.2%
Rothberg <i>et al.</i> '08 ^[92]	Observational	US	US	Hospital ≥65	493,971	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 49% (ranged from 34-55%)
Budnitz <i>et al.</i> '07 ^[93]	Observational	US	US	Hospital ≥65	177,504	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 10.5%
Rossi <i>et al.</i> '07 ^[97]	Observational	US	US	Community dwelling ≥60	128	Modified 1992 MAI criteria (unnecessary drug use)	Modified 1992 MAI unnecessary medication prevalence: 58.6%
Fick <i>et al.</i> '07 ^[98]	Observational	US	US	Community dwelling ≥65	17,971	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 40.7%
Nixdorff <i>et al.</i> '07 ^[99]	Observational	US	US	Hospital ≥65	124	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 29%
Steinman <i>et al.</i> '07 ^[102]	Observational	US	US	Community dwelling ≥65	196	2003 Beers' criteria 1992 MAI	2003 Beers' criteria PIP prevalence: 37% 1992 MAI PIP prevalence: 82%
Hustey <i>et al.</i> '07 ^[103]	Observational	US	US	Hospital ≥65	352	2003 Beers' Criteria 2003	2003 Beers' criteria PIP prevalence: 32%
Fahlman <i>et al.</i> '07 ^[108]	Observational	US	US	Community dwelling ≥65	4,602	1997 Beers' ID criteria	1997 Beers' ID criteria PIP prevalence: 44%
Bierman <i>et al.</i> '07 ^[109]	Observational	US	US	Community dwelling ≥65	965,756	Modified 2001 Zhan criteria	Modified 2001 Zhan criteria PIP prevalence: Men: 25.7% Women: 31%
Fu <i>et al.</i> '07 ^[110]	Observational	US	US	Community dwelling	720	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 15.97%

				≥65			
Cannon <i>et al.</i> '06 ^[111]	Observational	US	US	Hospital ≥65	786	Modified 1997 Beers' ID criteria	1997 Beers' PIP prevalence: 31%
Franic <i>et al.</i> '06 ^[113]	Observational	US	US	Community dwelling ≥65	444	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 16.7%
Page <i>et al.</i> '06 ^[119]	Observational	US	US	Hospital ≥75	389	Modified 2003 Beers' ID criteria	2003 Beers' PIP prevalence: 27.5%
Steinman <i>et al.</i> '06 ^[122]	Observational	US	US	Community dwelling ≥65	196	2003 Beers' criteria 1999 AOU criteria Modified 1992 MAI criteria (unnecessary drug use)	Modified 1992 MAI PIP prevalence: 57% 2003 Beers' criteria PIP prevalence: 37% 1999 AOU criteria PPO prevalence: 64%
Pugh <i>et al.</i> '06 ^[123]	Observational	US	US	Mixed dataset ≥65	1,096,361	2006 HEDIS criteria	2006 HEDIS criteria PIP prevalence: 19.6%
Barnett <i>et al.</i> '06 ^[124]	Observational	US	US	Community dwelling ≥65	281150	2001 Zhan criteria	2001 Zhan criteria PIP prevalence: Veterans Administration: 21.3% Health maintenance organization: 28.8%
Maio <i>et al.</i> '06 ^[125]	Observational	US	US	Community dwelling ≥65	100	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: Family Practice: 22% Senior citizens centre: 26%
Perri <i>et al.</i> '05 ^[128]	Observational	US	US	Long term care ≥65	1,117	1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence 46.5%
Hajjar <i>et al.</i> '05 ^[129]	Observational	US	US	Hospital ≥65	384	Modified 1992 MAI criteria (unnecessary drug use)	Modified 1992 MAI unnecessary drug use prevalence: 44%
Roth <i>et al.</i> '05 ^[131]	Observational	US	US	Community dwelling ≥60	100	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 34%
Lau <i>et al.</i> '05 ^[134]	Observational	US	US	Long term care ≥65	3,372	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 50.3%
Viswanathan <i>et al.</i> '05 ^[135]	Observational	US	US	Hospital ≥65	7,243	Modified 2003 Beers' ID criteria Modified 1997 Beers' ID criteria Modified 2001 Zhan criteria	Modified 2003 Beers' ID criteria PIP prevalence: 13.4% Modified 1997 Beers' ID criteria PIP prevalence: 8.8% Modified Zhan criteria PIP prevalence: 4.2%
Zuckerman <i>et al.</i> '05 ^[136]	Observational	US	US	Long term care ≥65	546	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: Before admission: Dementia: 20% Without dementia: 23% After admission: Before admission: Dementia: 19% Without dementia: 28%
Pugh <i>et al.</i> '05 ^[139]	Observational	US	US	Mixed dataset ≥65	1,265,434	Modified 2001 Zhan criteria (including 2003 Beers criteria relating to medications)	Modified 2001 Zhan criteria PIP prevalence: 23%

						considered potentially inappropriate based on dose)	
Rigler <i>et al.</i> '05 ^[140]	Observational	US	US	Mixed dataset ≥ 60	3,185	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: Ambulatory care patients: 21%, Patients in the Kansas Frail Elderly Program :48% Older nursing home residents: 38%
Onder <i>et al.</i> '05 ^[141]	Observational	US	US	Hospital ≥ 65	5,152	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 28.6%
Chang <i>et al.</i> '05 ^[142]	Observational	US	US	Community dwelling ≥ 65	550	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 11.6%
Rigler <i>et al.</i> '04 ^[147]	Observational	US	US	Mixed dataset ≥ 65	3,185	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: Ambulatory care patients: 21%, Patients in the Kansas Frail Elderly Program :48% Older nursing home residents: 38%
Brown <i>et al.</i> '04 ^[148]	Observational	US	US	Hospital ≥ 65	99	1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence rate: 10.1%
Curtis <i>et al.</i> '04 ^[149]	Observational	US	US	Community dwelling ≥ 65	765,423	Modified 1997 Beers' ID criteria	Modified 1997 Beers' criteria PIP prevalence rate: 21.2%
Fillenbaum <i>et al.</i> '04 ^[150]	Observational	US	US	Community dwelling ≥ 68	3,165	2002 DUR criteria 1997 Beers' ID criteria	2002 DUR PIP prevalence: 21.3% 1997 Beers' ID criteria PIP prevalence: 27.9%
Caterino <i>et al.</i> '04 ^[151]	Observational	US	US	Hospital ≥ 65	33,395	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: 12.6%
Lau <i>et al.</i> '04 ^[152]	Observational	US	US	Long term care ≥ 65	3,372	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 50%
Goulding <i>et al.</i> '04 ^[154]	Observational	US	US	Hospital ≥ 65	22,031	Modified 1997 Beers' ID criteria Modified 2001 Zhan criteria	Modified 1997 Beers' criteria PIP prevalence: 7.6-7.8% Modified 2001 Zhan criteria PIP prevalence: 3.7-3.8
Hanlon <i>et al.</i> '04 ^[155]	Observational	US	US	Hospital ≥ 65	397	Modified 1992 MAI (≥ 1 medications with MAI criteria rated as inappropriate)	Modified 1992 MAI PIP prevalence: 91.9%
Rhoads <i>et al.</i> '03 ^[157]	Intervention	US	US	Long term care ≥ 65	456	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: 31.6%
Gray <i>et al.</i> '03 ^[158]	Observational	US	US	Long term care ≥ 65	282	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: Baseline: 22% Over a one year period: 43.7%
Stuart <i>et al.</i> '03 ^[161]	Observational	US	US	Community dwelling ≥ 65	20244	Modified 1997 Beers' ID criteria	1997 Beers' Criteria PIP prevalence: 1995 CD: 24.8% 1995 DMB: 31.1% 1999 CD: 21.3% 1999 DMB: 31.5%
Edwards <i>et al.</i> '03 ^[162]	Observational	US	US	Hospital ≥ 65	349	1997 Beers' criteria	1997 Beers' criteria high severity PIP prevalence: 11.1-12.7%

							ACE unit: 11.1% General medicine:12.7%
Dhall <i>et al.</i> '02 ^[164]	Observational	US	US	Long term care ≥ 65	44,562	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: Admission: 33% After 90 days: 31%
Hanlon <i>et al.</i> '02 ^[165]	Observational	US	US	Community dwelling ≥ 65	5,742	2002 DUR criteria	2002 DUR criteria PIP prevalence: 19.2-21.0% 1990: 21.0% 1993: 19.2%
Hanlon <i>et al.</i> '02 ^[166]	Observational	US	US	Community dwelling ≥ 65	2,451	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: 28%
Dhalla <i>et al.</i> '02 ^[167]	Observational	US	US	Long term care ≥ 65	19,911	Modified 1997 Beers' ID criteria	1997 Beers' PIP prevalence: At admission: 25.4% At discharge: 20.8%
Sloane <i>et al.</i> '02 ^[168]	Observational	US	US	Long term care ≥ 65	2,014	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: 16.0%
Spiker <i>et al.</i> '01 ^[169]	Intervention	US	US	Community dwelling ≥ 65	146	Modified 1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 35.6%
Zhan <i>et al.</i> '01 ^[171]	Observational	US	US	Community dwelling ≥ 65	100	2001 Zhan criteria	2001 Zhan criteria PIP prevalence: 21.3%
Piecoro <i>et al.</i> '00 ^[172]	Observational	US	US	Mixed dataset ≥ 65	64,832	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: Combined: 27% Nursing home elders: 33.2% Community dwelling elders: 24.4%
Chin <i>et al.</i> '99 ^[174]	Observational	US	US	Community dwelling ≥ 65	898	Modified 1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 14.8%
Golden <i>et al.</i> '99 ^[175]	Observational	US	US	Community dwelling ≥ 60	2,193	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: 39.7%
Wilcox <i>et al.</i> '94 ^[178]	Observational	US	US	Community dwelling ≥ 65	6,171	Modified 1991 Beers' criteria	Modified 1991 Beers' criteria PIP prevalence: 28.7%
Stuck <i>et al.</i> '94 ^[179]	Observational	US	US	Community dwelling ≥ 75	414	Modified 1991 Beers' criteria	Modified 1991 Beers' criteria PIP prevalence: 14%
Beers <i>et al.</i> '92 ^[180]	Observational	US	US	Long term care ≥ 65	1,106	1991 Beers' Criteria	1991 Beers' Criteria PIP prevalence: 40.3%

Europe

Table 2.9. Summary table of all European studies

	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
O'Sullivan <i>et al.</i> '13 ^[1]	Observational	Ireland	Europe	Long term care ≥ 65	732	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 70.0% 2003 Beers' criteria PIP prevalence: 53.4%
Bakken <i>et al.</i> '12 ^[4]	Observational	Norway	Europe	Mixed dataset ≥ 70	400	2009 NORGE criteria	2009 NORGE criteria PIP prevalence: Overall: 24.1% at admission 34.8% at discharge Nursing Home 25.5% at admission 33.1% at discharge Medical Ward: 22.6% at admission 36.8% at discharge
Bradley <i>et al.</i> '12 ^[5]	Observational	Northern Ireland	Europe	Community dwelling ≥ 70	166,108	Modified 2008 STOPP criteria	Modified 2008 STOPP criteria PIP prevalence: 34.0%
Nyborg <i>et al.</i> '12 ^[6]	Observational	Norway	Europe	Community dwelling ≥ 70	445,900	2009 NORGE criteria	2009 NORGE criteria PIP prevalence: 34.8%
Garcia-Gollarte <i>et al.</i> '12 ^[9]	Observational	Spain	Europe	Long term care ≥ 65	100	2008 STOPP criteria 2008 START criteria 2006 Australian criteria	2008 STOPP PIP prevalence: 79.0%. 2006 Australian PIP prevalence: 95.0%. 2008 START PPO prevalence: 74.0%..
Ubeda <i>et al.</i> '12 ^[10]	Observational	Spain	Europe	Long term care ≥ 65	81	2008 STOPP criteria 2008 START criteria 2003 Beers criteria	Combined criteria PIP prevalence: 64.0% 2008 STOPP PIP prevalence: 48.0%. 2003 Beers' criteria PIP prevalence: 25.0%. 2008 START PPO prevalence: 44.0%..
Ryan <i>et al.</i> '12 ^[11]	Observational	Ireland	Europe	Long term care ≥ 65	313	2008 STOPP criteria 2008 START criteria	2008 STOPP PIP prevalence: 59.8%. 2008 START PPO prevalence: 42.2%..
Dalleur <i>et al.</i> '12 ^[12]	Observational	Belgium	Europe	Hospital ≥ 75	302	2008 STOPP criteria 2008 START criteria	2008 STOPP PIP prevalence: 48.0%. 2008 START PPO prevalence: 63.0%..
Parsons <i>et al.</i> '12 ^[13]	Observational	UK	Europe	Long term care ≥ 65	133	Modified 2008 STOPP criteria	Modified 2008 STOPP criteria PIP prevalence: Time point 1: 46.2% Time point 2: 40.9%

Amann <i>et al.</i> '12 ^[16]	Observational	Germany	Europe	Community dwelling ≥65	804,400	2010 PRISCUS List	2010 PRISCUS List PIP prevalence: 25.0-28.3%
Fouquet <i>et al.</i> '12 ^[17]	Observational	France	Europe	Hospital ≥75	150	2003 French modified Beers' criteria 2000 Modified IPET criteria	Combined criteria PIP prevalence: 26.7% 2003 French modified Beers' criteria PIP prevalence: 24.0%. 2000 Modified IPET criteria PIP prevalence: 9.3%.
Shah <i>et al.</i> '12 ^[18]	Observational	UK	Europe	Mixed dataset ≥65	Nursing Home (NH)- 10, 387 Community dwelling (CD)- 403,259	Modified 2003 Beers' criteria	Modified 2003 Beers' criteria PIP prevalence: Nursing Home: 33.0% Community dwelling: 21.4%
Borges <i>et al.</i> '11 ^[19]	Observational	Portugal	Europe	Hospital ≥65	105	2008 START criteria	2008 START criteria PPO prevalence: 41.9%.
Goltz <i>et al.</i> '11 ^[20]	Observational	Germany	Europe	Community dwelling ≥65	2003- 12,513,584 2004- 10,126,809	Modified 2003 Beers' criteria	Modified 2003 Beers' criteria PIP prevalence: 2003: 21.7% 2004: 18.2%
Kolzsch <i>et al.</i> '11 ^[22]	Observational	Germany	Europe	Long term care ≥65	8,685	Modified German 2007 La Roche criteria	2007 La Roche criteria PIP prevalence: 21.9%
Leikola <i>et al.</i> '11 ^[30]	Observational	Finland	Europe	Community dwelling ≥65	841,509	Modified Finnish 2003 Beers' ID criteria	Modified Finnish 2003 Beers' ID criteria PIP Prevalence:14.7% (n=123545)
Barnett <i>et al.</i> '11 ^[31]	Observational	UK	Europe	Mixed dataset ≥65	70,299	Modified UK 2003 Beers' ID criteria	Modified UK 2003 Beers' ID criteria PIP prevalence: Community dwelling: 30.9% Long term care: 37.1%
Gallagher <i>et al.</i> '11 ^[34]	Observational	Europe	Europe	Hospital ≥65	900	2008 STOPP criteria 2008 START criteria 2003 Beers' criteria	Overall 2008 STOPP PIM prevalence was 51.3%. Ranging from 34.7- 77.3% Overall 2003 Beers' PIP prevalence was 30.4%. Ranging from 22.7-43.3%. Overall 2008 START PPO prevalence was 59.4%. Ranging from 51.3- 72.7%.
Luo <i>et al.</i> '11 ^[36]	Observational	Northern Ireland	Europe	Hospital ≥65	192	2003 Beers' criteria 2000 IPET 2006 HEDIS criteria	2003 Beers' criteria PIP prevalence: 25.1-30.7% 2000 IPET PIP prevalence: 19-27.4% 2006 HEDIS PIP prevalence: 5.6-9.7%
Gallagher <i>et al.</i> '11 ^[38]	Intervention	Ireland	Europe	Hospital ≥65	400	2008 STOPP criteria 2008 START criteria	2008 combined STOPP and START criteria combined prevalence: 58.4%

						1992 MAI 1999 AOU criteria	1992 MAI prevalence: 48% 1999 AOU criteria prevalence: 37%
Lang <i>et al.</i> '11 ^[39]	Intervention	Switzerland	Europe	Hospital ≥ 65	134	2008 STOPP criteria (French adaption) 2008 START criteria (French adaption)	2008 STOPP criteria PIP prevalence: Admission: 77.3% Discharge: 18.6% 2008 START criteria PPO prevalence: Admission: 64.7% Discharge: 11.2%
Fiss <i>et al.</i> '11 ^[42]	Observational	Germany	Europe	Community dwelling ≥ 65	744	Modified German 2003 Beers' criteria	Modified German 2003 Beers' criteria PIP prevalence: 18%
Hamilton <i>et al.</i> '11 ^[44]	Observational	Ireland	Europe	Hospital ≥ 65	600	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 56.2% 2003 Beers' criteria PIP prevalence: 28.8%
Somers <i>et al.</i> '10 ^[51]	Observational	Belgium	Europe	Hospital ≥ 65	110	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: Admission: 20% Discharge: 16%
Blozik <i>et al.</i> '10 ^[53]	Intervention	Switzerland	Europe	Long term care ≥ 60	181	Modified Beers' 2003 ID criteria	2003 Beers' PIP rate: 14.5% pre-intervention and 2.8% post-in intervention
Maio <i>et al.</i> '10 ^[56]	Observational	Italy	Europe	Community dwelling ≥ 65	91,741	Modified 2003 Beers' ID criteria	2003 Beers ID criteria PIP prevalence: 25.8%
Conejos Miquel <i>et al.</i> '10 ^[57]	Observational	Spain	Europe	Mixed dataset ≥ 65	150	2003 Beers' criteria 2008 STOPP criteria 2008 START criteria	Primary Care 2003 Beers' criteria PIP prevalence: 24% 2008 STOPP criteria PIP prevalence: 36% 2008 START criteria PIP prevalence: 28% Secondary Care 2003 Beers' criteria PIP prevalence: 26% 2008 STOPP criteria PIP prevalence: 54% 2008 START criteria PIP prevalence: 54% Nursing Home Care 2003 Beers' criteria PIP prevalence: 20% 2008 STOPP criteria PIP prevalence: 50% 2008 START criteria PIP prevalence: 46%
Ruggiero <i>et al.</i> '10 ^[58]	Observational	Italy	Europe	Long term care ≥ 65	1,716	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 48%
Pozzi <i>et al.</i> '10 ^[59]	Observational	Italy	Europe	Community dwelling ≥ 65	1,022	Modified 1991 Beers' criteria	1991 Beers' criteria PIP prevalence: 9%
Lang <i>et al.</i> '10 ^[63]	Observational	Switzerland	Europe	Hospital ≥ 65	150	2008 STOPP criteria (French adaption) 2008 START criteria (French adaption)	2008 STOPP criteria PIP prevalence: 77% START PPO RATE: 65%.

Cahir <i>et al.</i> '10 ^[64]	Observational	Ireland	Europe	Community dwelling ≥70	338,801	Modified 2008 STOPP criteria	Modified STOPP criteria PIP prevalence: 36% (121 454 claimants)
Ruggiero <i>et al.</i> '09 ^[68]	Observational	Italy	Europe	Long term care ≥65	496	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 27.7%
Bergkvist <i>et al.</i> '09 ^[69]	Intervention	Sweden	Europe	Hospital ≥65	53	1992 MAI	1992 MAI PIP prevalence: Admission: Controls: 96% Intervention: 86% Discharge: Controls: 96% Intervention: 79%
Corsonello <i>et al.</i> '09 ^[70]	Observational	Italy	Europe	Hospital ≥65	506	2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 20.6%
Berdot <i>et al.</i> '09 ^[71]	Observational	France	Europe	Community dwelling ≥65	6,343	Combined criteria (Modified 1997 Beers' ID criteria and modified 2003 Beers' ID criteria and La Roche criteria)	Combined criteria PIP prevalence: 31.6% 2003 Beers' criteria PIP prevalence: 18.3%
Ryan <i>et al.</i> '09 ^[73]	Observational	Ireland	Europe	Community dwelling ≥65	1,329	2003 Beers' criteria 2008 STOPP criteria 2008 START criteria	2008 STOPP criteria PIP prevalence: 21.4% 2008 START criteria PPO prevalence: 22.7%
Bongue <i>et al.</i> '09 ^[74]	Observational	France	Europe	Community dwelling ≥65	30,683	Modified 1997 Beers' ID criteria 2001 French list of PIP criteria (Based on the 1997 Beers' ID criteria)	Modified 1997 Beers' ID criteria PIP prevalence rate: 10.1% 2001 French list of PIP criteria prevalence rate : 25.4%
Lapi <i>et al.</i> '09 ^[75]	Observational	Italy	Europe	Community dwelling ≥65	568	Modified 1991 Beers' criteria	Modified 1991 Beers' criteria PIP prevalence: 9.1% 2003 Beers' criteria PIP prevalence: 13%
Ryan <i>et al.</i> '09 ^[76]	Observational	Ireland	Europe	Community dwelling ≥65	500	2003 Beers' criteria 2000 IPET criteria	2000 IPET criteria PIP prevalence: 10.4%
Wawruch <i>et al.</i> '08 ^[82]	Observational	Slovakia	Europe	Hospital ≥65	600	Modified 2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 21%
Prudent <i>et al.</i> '08 ^[83]	Observational	France	Europe	Hospital ≥75	1,176	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 28.2%
Gallagher <i>et al.</i> '08 ^[84]	Observational	Ireland	Europe	Hospital ≥65	715	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 35% 2003 Beers' criteria PIP prevalence: 25%
Schuler <i>et al.</i> '08 ^[85]	Observational	Austria	Europe	Hospital ≥75	543	Modified 2003 Beers' criteria	Modified 2003 Beers' criteria PIP prevalence: 30.1%
Carey <i>et al.</i> '08 ^[86]	Observational	UK	Europe	Community dwelling	218,567	Modified 2003 Beers' criteria	2003 Beers' PIP prevalence:

				≥65			1996: 32.2% 2005:28.3%
Hosia-Randell <i>et al.</i> '08 ^[87]	Observational	Finland	Europe	Long term care ≥65	1,987	Modified 2003 Beers' ID criteria	2003 Beers' PIP prevalence: 34.9%
Radozevic <i>et al.</i> '08 ^[88]	Observational	Croatia	Europe	Hospital ≥65	225	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence rate: 22%
Gallagher <i>et al.</i> '08 ^[91]	Observational	Ireland	Europe	Hospital ≥65	597	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 32%
Spinewine <i>et al.</i> '07 ^[94]	Intervention	Belgium	Europe	Hospital ≥70	203	Modified 1997 Beers' ID criteria 1992 MAI 2001 ACOVE criteria	1997 Beers' PIP prevalence: 30% 1992 MAI PIP prevalence: 60% 2001 ACOVE criteria PIP prevalence: 78%
Barry <i>et al.</i> '07 ^[95]	Observational	Ireland	Europe	Hospital ≥65	600	2008 START criteria	2008 START criteria PPO prevalence: 57.8%
Rajska-Neumann <i>et al.</i> '07 ^[96]	Observational	Poland	Europe	Community dwelling ≥65	1,000	1997 Beers' ID criteria	1997 Beers' ID criteria PIP prevalence: Overall: 28.3 Poznan: 28.6% Glogow: 27.2%
Bergman <i>et al.</i> '07 ^[100]	Observational	Sweden	Europe	Long term care ≥65	7,904	2008 Swedish quality indicators (incorporating elements of the 1997 Beers' ID criteria)	2008 Swedish quality indicators PIP prevalence: 74%
Landi <i>et al.</i> '07 ^[104]	Observational	Italy	Europe	Community dwelling ≥80	364	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 26%
Bregnhøj <i>et al.</i> '07 ^[105]	Observational	Denmark	Europe	Community dwelling >65	212	MAI	1992 MAI PIP prevalence: 94.3%
De Wilde <i>et al.</i> '07 ^[107]	Observational	UK	Europe	Mixed dataset ≥65	162,000	Modified 2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 2003: 32.2% (20.5% on high risk medications) 1994: 32.9% (21.4% on high risk medications)
De Oliveira Martins <i>et al.</i> '06 ^[112]	Observational	Portugal	Europe	Community dwelling ≥65	213	1997 Beers' ID criteria 2003 Beers' ID criteria	1997 Beers' criteria PIP prevalence: 27.7% 2003 Beers' criteria PIP prevalence: 38.5%
Raivio <i>et al.</i> '06 ^[116]	Observational	Finland	Europe	Mixed dataset ≥70	425	Modified Finnish 1997 Beers' ID criteria	Modified Finnish 1997 Beers' ID criteria PIP prevalence: 36.2%
Egger <i>et al.</i> '06 ^[117]	Observational	Switzerland	Europe	Hospital ≥65	800	Modified Swiss 2003 Beers' criteria	Modified Swiss 2003 Beers' criteria PIP prevalence: Medical ward: Admission: 16.0% Discharge: 13.3% Geriatric ward Admission: 20.8%, Discharge: 15.9%
Barry <i>et al.</i> '06 ^[118]	Observational	Ireland	Europe	Hospital ≥65	350	2003 Beers' criteria 2000 IPET	2003 Beers' PIP prevalence: 34.6% 2000 IPET PIP prevalence: 22%

Maio <i>et al.</i> '06 ^[120]	Observational	Italy	Europe	Mixed dataset ≥ 65	849,425	Modified 2003 Beers' ID criteria	2003 Beers' PIP prevalence: 18%
Wawruch <i>et al.</i> '06 ^[121]	Observational	Slovakia	Europe	Hospital ≥ 65	600	2003 Beers' criteria	2003 Beers' PIP prevalence: Admission: 20.2% Discharge: 20%
Laroche <i>et al.</i> '06 ^[126]	Observational	France	Europe	Hospital ≥ 70	2,018	2001 French list of PIP criteria (Based on the 1997 Beers' ID criteria)	2001 French PIP criteria prevalence: 66%
Lechevallier-Michel <i>et al.</i> '05 ^[130]	Observational	France	Europe	Community dwelling ≥ 65	9,294	2001 French list of PIP criteria (Based on the 1997 Beers' ID criteria)	2001 French PIP criteria prevalence: 38.7%
Klarin <i>et al.</i> '05 ^[133]	Observational	Sweden	Europe	Mixed dataset ≥ 75	785	Combined criteria (Modified 1997 Beers' criteria and modified 1997 McLeod criteria)	Combined criteria PIP prevalence: 18.6%
Saltvedt <i>et al.</i> '05 ^[137]	Intervention	Norway	Europe	Hospital ≥ 75	254	1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: Patients in a geriatric evaluation and management unit: 10% Patients in a general medical ward: 9%
Van der Hooft <i>et al.</i> '05 ^[138]	Observational	Netherlands	Europe	Hospital ≥ 65	120,218	1997 Beers' criteria 2003 Beers criteria	1997 Beers' criteria PIP prevalence: 16.8%-18.5% 2003 Beers' criteria PIP prevalence: 19.1%-20.0%
Fialova <i>et al.</i> '05 ^[143]	Observational	Europe-Czech Republic, Denmark, Finland, Iceland, Italy, the Netherlands, Norway, and the United Kingdom.	Europe	Community dwelling ≥ 65	2,707	Modified 1997 Beers' ID criteria Modified 2003 Beers' ID criteria Modified 1997 McLeod criteria	Overall: Combination of all 3 tools PIP prevalence rate: 19.8 Modified 1997 Beers' ID criteria PIP prevalence: 3.3-17.1% Modified 2003 Beers' ID criteria PIP prevalence: 5.8-25.2% Modified 1997 McLeod criteria PIP prevalence: 3.0-31.8%
Heininger-Rothbucher <i>et al.</i> '03 ^[159]	Observational	Austria	Europe	Hospital ≥ 60	195	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 12.3%
Onder <i>et al.</i> '03 ^[160]	Observational	Italy	Europe	Hospital ≥ 65	5,734	Modified 1997 Beers' ID criteria	1997 Beers' PIP prevalence: 14.6%
Pitkala <i>et al.</i> '02 ^[163]	Observational	Finland	Europe	Mixed dataset ≥ 65	2,511	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 12.5%
Lunn <i>et al.</i> '97 ^[176]	Observational	UK	Europe	Long term care ≥ 60	101	1997 Lunn consensus PIP criteria	1997 Lunn consensus criteria PIP prevalence: 53%

Asia

Table 2.10. Summary table of all Asian studies

	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Vishwas <i>et al.</i> '12 ^[2]	Observational	India	Asia	Hospital ≥60	540	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 13.3% 2003 Beers' criteria PIP prevalence: 24.6%
Chen <i>et al.</i> '12 ^[3]	Observational	Malaysia	Asia	Long term care ≥65	211	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 23.7% 2003 Beers' criteria PIP prevalence: 32.7%
Yasein <i>et al.</i> '12 ^[8]	Observational	Jordan	Asia	Hospital ≥65	400	2003 Beers' criteria	2003 Beers' ID criteria PIP prevalence: 29.5% 2003 Beers' CD criteria PIP prevalence: 7.0%
Al-Omar <i>et al.</i> '12 ^[15]	Observational	Saudi Arabia	Asia	Hospital ≥65	2,052	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 29.5%
Gopinath <i>et al.</i> '11 ^[23]	Observational	India	Asia	Hospital ≥65	170	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 45.3 %
Lin <i>et al.</i> '11 ^[28]	Observational	Taiwan	Asia	Community dwelling ≥65	327	Modified 2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 5% (90/327)
Mandavi <i>et al.</i> '11 ^[33]	Observational	India	Asia	Community dwelling ≥60	1,081	Modified 2003 Beers' criteria	2003 Beers' PIP prevalence: 10.8%
Liu <i>et al.</i> '11 ^[37]	Observational	Taiwan	Asia	Hospital ≥65	520	2008 STOPP criteria 2008 START criteria	2008 STOPP criteria PIP prevalence: 36.2% 2008 START criteria PPO prevalence: 41.9%.
Ghadimi <i>et al.</i> '11 ^[40]	Observational	Iran	Asia	Community dwelling ≥65	2,041	Modified 2003 Beers' ID criteria.	Modified 2003 Beers' ID PIP prevalence: 30% (27% for men; 33% for women).
Sakuma <i>et al.</i> '11 ^[41]	Observational	Japan	Asia	Hospital ≥65	2,155	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 56.1%
Shah <i>et al.</i> '11 ^[43]	Observational	India	Asia	Hospital ≥65	400	2003 Beers' criteria 1998 Phadke's criteria of rationale prescribing	2003 Beers' criteria PIP prevalence: 27.25% 1998 Phadke's criteria of irrational prescribing prevalence: 28.3%
Akazawa <i>et al.</i> '10 ^[50]	Observational	Japan	Asia	Community dwelling ≥65	6,628	Modified Japanese 2003 Beers' ID criteria	Modified Japanese 2003 Beers' criteria PIP prevalence: 43.6%
Harugeri <i>et al.</i> '10 ^[52]	Observational	India	Asia	Hospital ≥60	814	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 23.5%
Zaveri <i>et al.</i> '10 ^[54]	Observational	India	Asia	Hospital ≥65	407	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 23.59%
Chen <i>et al.</i> '09 ^[72]	Observational	Taiwan	Asia	Hospital ≥65	1,429,463	Modified 2003 Beers' ID criteria	2003 Beers' PIP prevalence: 14.7%
Lai <i>et al.</i> '09 ^[77]	Observational	Taiwan	Asia	Hospital ≥65	8,213,147	Modified Taiwanese 2003 Beers' ID criteria	Modified Taiwanese 2003 Beers' ID PIP prevalence: 63.8% over the study period.
Mansur <i>et al.</i> '09 ^[80]	Observational	Israel	Asia	Hospital ≥65	212	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: At admission: 43.5% At discharge: 44.4%
Lin <i>et al.</i> '08 ^[90]	Observational	Taiwan	Asia	Hospital ≥65	5,741	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 23.7%
Mandavi <i>et al.</i> '07	Observational	India	Asia	Hospital ≥60	515	Modified 2003 Beers' Criteria	2003 Beers' criteria PIP prevalence: 17.9%

[101]							
Niwata <i>et al.</i> '06 [114]	Observational	Japan	Asia	Long term care ≥ 65	1,669	Modified 2003 Beers' criteria	Modified 2003 Beers' criteria PIP prevalence: 21.1%
Saab <i>et al.</i> '06 [115]	Observational	Lebanon	Asia	Community dwelling ≥ 65	350	2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 22.4%
Ay <i>et al.</i> '05 [127]	Observational	Turkey	Asia	Community dwelling ≥ 70	1,019	Modified Turkish 1997 Beers' ID criteria	Modified Turkish 1997 Beers' ID criteria PIP prevalence: 9.8%
Azoulay <i>et al.</i> '05 [132]	Observational	Iran	Asia	Community dwelling ≥ 65	3,000	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: 27.6%
Mamun <i>et al.</i> '04 [145]	Observational	Singapore	Asia	Long term care ≥ 65	454	Modified 1997 Beers' criteria	Modified 1997 Beers' criteria PIP prevalence: 70.04%
Chang <i>et al.</i> '04 [153]	Observational	Taiwan	Asia	Community dwelling ≥ 65	882	1997 Beers' criteria	1997 Beers' PIP prevalence: 10.5%

Canada

Table 2.11. Summary table of all Canadian studies

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Howard <i>et al.</i> '04 [144]	Observational	Canada	Canada	Community dwelling ≥65	777	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence:16.3%
Rancourt <i>et al.</i> 04 [156]	Observational	Canada	Canada	Long term care ≥65	2,633	2004 Rancourt et al. consensus criteria (largely based on the Beers' and the McLeod criteria)	2004 Rancourt consensus criteria PIP prevalence: 54.7%
Gill <i>et al.</i> '01 [170]	Intervention	Canada	Canada	Long term care ≥65	355	2000 IPET	2000 IPET PIP prevalence: 18.3%
Naugler <i>et al.</i> '00 [173]	Observational	Canada	Canada	Hospital ≥70	361	2000 IPET	2000 IPET PIP prevalence rate:12.5%
Anderson <i>et al.</i> '97 [177]	Observational	Canada	Canada	Community dwelling ≥65	355,600	Modified 1991 Beers' criteria	Modified 1991 Beers' criteria PIP prevalence: 22%

Australia

Table 2.12. Summary table of all Australian studies

Study	Study type	Country	Jurisdiction	Care setting /age category	No patients	Criteria	PIP Prevalence
Wahab <i>et al.</i> '12 ^[14]	Observational	Australia	Australia	Hospital ≥ 65	100	2008 STOPP criteria	2008 STOPP PIP prevalence: 60.0%.
Widagdo <i>et al.</i> '11 ^[24]	Observational	Australia	Australia	Hospital ≥ 65	100	2003 Beers' criteria (high severity)	2003 Beers' criteria PIP prevalence: Admission: 42% Discharge: 39%
Stafford <i>et al.</i> '11 ^[32]	Observational	Australia	Australia	Long term care ≥ 65	2,345	2003 Beers' criteria 1997 McLeod criteria	Combined criteria PIP prevalence: 43.8% 2003 Beers' criteria PIP prevalence: 35.3% 1997 McLeod criteria PIP prevalence: 18.7%
Castelino <i>et al.</i> '10 ^[62]	Observational	Australia	Australia	Community dwelling ≥ 65	372	2003 Beers' criteria 2007 DBI	2003 Beers' criteria prevalence: 39.8% 2007 DBI PIP prevalence: 60.5%
Pattanworasate <i>et al.</i> '10 ^[65]	Observational	Australia	Australia	Hospital ≥ 65	202	Modified Australian 2003 Beers' criteria Modified Australian 1997 McLeod criteria Modified 2006 NPS criteria	Combined criteria PIP prevalence: 55% Modified Australian 2003 Beers' criteria PIP prevalence: 44% Modified Australian 1997 McLeod criteria PIP prevalence: 41% Modified 2006 NPS criteria PIP prevalence: 16%
Roughead <i>et al.</i> '07 ^[106]	Observational	Australia	Australia	Community Dwelling ≥ 70	192,363	Combined criteria (Modified 2003 Beers' ID criteria and modified 1997 McLeod criteria)	Combined criteria PIP prevalence: 21.2%

Africa

Table 2.13. Summary table of all African studies

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Kamuhabwa <i>et al.</i> '10 ^[55]	Observational	Tanzania	Africa	Hospital ≥65	514	Modified 2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 11.4%
Chetty <i>et al.</i> '04 ^[146]	Observational	South Africa	Africa	Mixed dataset ≥65	6,410	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence rate: 30.0%

South America

Table 2.14. Summary table of all South American studies

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Oliveira <i>et al.</i> ' 12 ^[7]	Observational	Brazil	South America	Community dwelling ≥60	139	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 34.5%

Screening tools

- Beers' criteria
- 2003 Beers' criteria
- 1997 Beers' criteria
- 1991 Beers' criteria
- Screening Tool of Older Persons' Prescriptions (STOPP) criteria
- Medication Appropriateness Index (MAI)
- Zhan criteria
- McLeod criteria
- IPET criteria
- HEDIS criteria
- French list of PIP Criteria
- French consensus criteria
- Assessment of Care of Vulnerable Elders (ACOVE) criteria
- Drug Underutilization Review (DUR) criteria
- Phadkes' criteria
- Drug Burden Index (DBI)
- Swedish Quality Indicators
- Rancourt criteria
- Lunn criteria
- National Prescribing Service (NPS) Indicators of Quality Prescribing
- Screening Tool to Alert doctors to Right Treatment (START) criteria
- Assessment of Underutilisation (AOU) criteria

Beers' criteria

Table 2.15. Summary table of studies which have used the Beers' Criteria in older individuals

	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
O'Sullivan <i>et al.</i> '13 ^[1]	Observational	Ireland	Europe	Long term care ≥65	732	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 70.0% 2003 Beers' criteria PIP prevalence: 53.4%
Vishwas <i>et al.</i> '12 ^[2]	Observational	India	Asia	Hospital ≥60	540	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 13.3% 2003 Beers' criteria PIP prevalence: 24.6%
Chen <i>et al.</i> '12 ^[3]	Observational	Malaysia	Asia	Long term care ≥65	211	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 23.7% 2003 Beers' criteria PIP prevalence: 32.7%
	Observational	Brazil	South America	Community dwelling ≥60	139	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 34.5%
Yasein <i>et al.</i> '12 ^[8]	Observational	Jordan	Asia	Hospital ≥65	400	2003 Beers' criteria	2003 Beers' ID criteria PIP prevalence: 29.5% 2003 Beers' CD criteria PIP prevalence: 7.0%
Ubeda <i>et al.</i> '12 ^[10]	Observational	Spain	Europe	Long term care ≥65	81	2008 STOPP criteria 2008 START criteria 2003 Beers criteria	Combined criteria PIP prevalence: 64.0% 2008 STOPP PIP prevalence: 48.0%. 2003 Beers' criteria PIP prevalence: 25.0%. 2008 START PPO prevalence: 44.0%..
Al-Omar <i>et al.</i> '12 ^[15]	Observational	Saudi Arabia	Asia	Hospital ≥65	2,052	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 29.5%
Fouquet <i>et al.</i> '12 ^[17]	Observational	France	Europe	Hospital ≥75	150	2003 French modified Beers' criteria 2000 Modified IPET criteria	Combined criteria PIP prevalence: 26.7% 2003 French modified Beers' criteria PIP prevalence: 24.0%. 2000 Modified IPET criteria PIP prevalence: 9.3%.
Shah <i>et al.</i> '12 ^[18]	Observational	UK	Europe	Mixed dataset ≥65	Nursing Home (NH)-10, 387 Community dwelling (CD)-403,259	Modified 2003 Beers' criteria	Modified 2003 Beers' criteria PIP prevalence: Nursing Home: 33.0% Community dwelling: 21.4%
Goltz <i>et al.</i> '11 ^[20]	Observational	Germany	Europe	Community dwelling ≥65	2003-12,513,584 2004-10,126,809	Modified 2003 Beers' criteria	Modified 2003 Beers' criteria PIP prevalence: 2003: 21.7% 2004: 18.2%

Gopinath <i>et al.</i> '11 ^[23]	Observational	India	Asia	Hospital ≥65	170	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 45.3 %
Widagdo <i>et al.</i> '11 ^[24]	Observational	Australia	Australia	Hospital ≥65	100	2003 Beers' criteria (high severity)	2003 Beers' criteria PIP prevalence: Admission: 42% Discharge: 39%
Dunn <i>et al.</i> '11 ^[25]	Intervention	US	US	Community dwelling ≥65	120	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 37.5%
Bao <i>et al.</i> '11 ^[26]	Observational	US	US	Community dwelling ≥65	3,124	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 38%
Lund <i>et al.</i> '11 ^[27]	Intervention	US	US	Community dwelling ≥65	407	1997 Beers' criteria 2003 Beers' criteria	1997 Beers' criteria PIP prevalence in the PCM patients: 31.1% 2003 Beers' criteria PIP prevalence in the EPOC patients: 44.2%
Lin <i>et al.</i> '11 ^[28]	Observational	Taiwan	Asia	Community dwelling ≥65	327	Modified 2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 5% (90/327)
Woelfel <i>et al.</i> '11 ^[29]	Observational	US	US	Hospital ≥65	295	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 18%
Leikola <i>et al.</i> '11 ^[30]	Observational	Finland	Europe	Community dwelling ≥65	841,509	Modified Finnish 2003 Beers' ID criteria	Modified Finnish 2003 Beers' ID criteria PIP Prevalence: 14.7% (n=123545)
Barnett <i>et al.</i> '11 ^[31]	Observational	UK	Europe	Mixed dataset ≥65	70,299	Modified UK 2003 Beers' ID criteria	Modified UK 2003 Beers' ID criteria PIP prevalence: Community dwelling: 30.9% Long term care: 37.1%
Stafford <i>et al.</i> '11 ^[32]	Observational	Australia	Australia	Long term care ≥65	2,345	2003 Beers' criteria 1997 McLeod criteria	Combined criteria PIP prevalence: 43.8% 2003 Beers' criteria PIP prevalence: 35.3% 1997 McLeod criteria PIP prevalence: 18.7%
Mandavi <i>et al.</i> '11 ^[33]	Observational	India	Asia	Community dwelling ≥60	1,081	Modified 2003 Beers' criteria	2003 Beers' PIP prevalence: 10.8%
Gallagher <i>et al.</i> '11 ^[34]	Observational	Europe	Europe	Hospital ≥65	900	2008 STOPP criteria 2008 START criteria 2003 Beers' criteria	Overall 2008 STOPP PIM prevalence was 51.3%. Ranging from 34.7- 77.3% Overall 2003 Beers' PIP prevalence was 30.4%. Ranging from 22.7-43.3%. Overall 2008 START PPO prevalence was 59.4%. Ranging from 51.3- 72.7%.
Luo <i>et al.</i> '11 ^[36]	Observational	Northern Ireland	Europe	Hospital ≥65	192	2003 Beers' criteria 2000 IPET 2006 HEDIS criteria	2003 Beers' criteria PIP prevalence: 25.1-30.7% 2000 IPET PIP prevalence: 19-27.4% 2006 HEDIS PIP prevalence: 5.6-9.7%

Ghadimi <i>et al.</i> '11 ^[40]	Observational	Iran	Asia	Community dwelling ≥65	2,041	Modified 2003 Beers' ID criteria.	Modified 2003 Beers' ID PIP prevalence: 30% (27% for men; 33% for women).
Sakuma <i>et al.</i> '11 ^[41]	Observational	Japan	Asia	Hospital ≥65	2,155	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 56.1%
Fiss <i>et al.</i> '11 ^[42]	Observational	Germany	Europe	Community dwelling ≥65	744	Modified German 2003 Beers' criteria	Modified German 2003 Beers' criteria PIP prevalence: 18%
Shah <i>et al.</i> '11 ^[43]	Observational	India	Asia	Hospital ≥65	400	2003 Beers' criteria 1998 Phadke's criteria of rationale prescribing	2003 Beers' criteria PIP prevalence: 27.25% 1998 Phadke's criteria of irrational prescribing prevalence: 28.3%
Hamilton <i>et al.</i> '11 ^[44]	Observational	Ireland	Europe	Hospital ≥65	600	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 56.2% 2003 Beers' criteria PIP prevalence: 28.8%
Golden <i>et al.</i> '11 ^[45]	Observational	US	US	Community dwelling ≥65	3,911	Modified 2003 Beers' ID criteria (high risk medications)	Modified 2003 Beers ID criteria PIP rate: 25.2%
Albert <i>et al.</i> '10 ^[46]	Observational	US	US	Community dwelling ≥65	7,459	Modified 2003 Beers' criteria 2006 HEDIS criteria	2003 Beers' criteria PIP prevalence: 53.5% 2006 HEDIS PIP prevalence: 38.8%
Shiyanbola <i>et al.</i> '10 ^[47]	Observational	US	US	Community dwelling ≥65	874	2003 Beers' criteria Modified 2001 ACOVE criteria	2003 Beers' criteria PIP prevalence: 26.5% Modified 2001 ACOVE criteria PIP prevalence: 34.7% Combined criteria PIP prevalence: 45.8%
Lau <i>et al.</i> '10 ^[48]	Observational	US	US	Community dwelling ≥65	4,087	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 17% overall 15% in patients with dementia 20% in patients without dementia
Fu <i>et al.</i> '10 ^[49]	Observational	US	US	Community dwelling ≥65	1,774	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 2005: 20% 2006: 16%
Akazawa <i>et al.</i> '10 ^[50]	Observational	Japan	Asia	Community dwelling ≥65	6,628	Modified Japanese 2003 Beers' ID criteria	Modified Japanese 2003 Beers' criteria PIP prevalence: 43.6%
Somers <i>et al.</i> '10 ^[51]	Observational	Belgium	Europe	Hospital ≥65	110	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: Admission: 20% Discharge: 16%
Harugeri <i>et al.</i> '10 ^[52]	Observational	India	Asia	Hospital ≥60	814	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 23.5%
Blozik <i>et al.</i> '10 ^[53]	Intervention	Switzerland	Europe	Long term care ≥60	181	Modified Beers' 2003 ID criteria	2003 Beers' PIP rate: 14.5% pre-intervention and 2.8% post-in intervention
Zaveri <i>et al.</i> '10 ^[54]	Observational	India	Asia	Hospital ≥65	407	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 23.59%
Kamuhabwa <i>et al.</i> '10 ^[55]	Observational	Tanzania	Africa	Hospital ≥65	514	Modified 2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 11.4%

Maio <i>et al.</i> '10 ^[56]	Observational	Italy	Europe	Community dwelling ≥65	91,741	Modified 2003 Beers' ID criteria	2003 Beers ID criteria PIP prevalence: 25.8%
Conejos Miquel <i>et al.</i> '10 ^[57]							Primary Care 2003 Beers' criteria PIP prevalence: 24% 2008 STOPP criteria PIP prevalence: 36% 2008 START criteria PIP prevalence: 28% Secondary Care 2003 Beers' criteria PIP prevalence: 26% 2008 STOPP criteria PIP prevalence: 54% 2008 START criteria PIP prevalence: 54% Nursing Home Care 2003 Beers' criteria PIP prevalence: 20% 2008 STOPP criteria PIP prevalence: 50% 2008 START criteria PIP prevalence: 46%
	Observational	Spain	Europe	Mixed dataset ≥65	150	2003 Beers' criteria 2008 STOPP criteria 2008 START criteria	
Ruggiero <i>et al.</i> '10 ^[58]	Observational	Italy	Europe	Long term care ≥65	1,716	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 48%
Pozzi <i>et al.</i> '10 ^[59]	Observational	Italy	Europe	Community dwelling ≥65	1,022	Modified 1991 Beers' criteria	1991 Beers' criteria PIP prevalence: 9%
Lund <i>et al.</i> '10 ^[61]	Observational	US	US	Community dwelling ≥65	240	2003 Beers' criteria 1992 MAI	2003 Beers' criteria PIP prevalence : 48.7% 1992 MAI prevalence: 54.3%
Castelino <i>et al.</i> '10 ^[62]	Observational	Australia	Australia	Community dwelling ≥65	372	2003 Beers' criteria 2007 DBI	2003 Beers' criteria prevalence: 39.8% 2007 DBI PIP prevalence: 60.5%
Pattanworasate <i>et al.</i> '10 ^[65]							Combined criteria PIP prevalence: 55% Modified Australian 2003 Beers' criteria PIP prevalence: 44% Modified Australian 1997 McLeod criteria PIP prevalence: 41% Modified 2006 NPS criteria PIP prevalence: 16%
	Observational	Australia	Australia	Hospital ≥65	202	Modified Australian 2003 Beers' criteria Modified Australian 1997 McLeod criteria Modified 2006 NPS criteria	
Dedhiya <i>et al.</i> '10 ^[66]	Observational	US	US	Long term care ≥65	7,594	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 42.1%.
Ruggiero <i>et al.</i> '09 ^[68]	Observational	Italy	Europe	Long term care ≥65	496	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 27.7%
Corsonello <i>et al.</i> '09 ^[70]	Observational	Italy	Europe	Hospital ≥65	506	2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 20.6%
Berdot <i>et al.</i> '09 ^[71]	Observational	France	Europe	Community dwelling ≥65	6,343	Combined criteria (Modified 1997 Beers' ID criteria and modified 2003 Beers' ID criteria and La Roche criteria)	Combined criteria PIP prevalence: 31.6%

Chen <i>et al.</i> '09 ^[72]	Observational	Taiwan	Asia	Hospital ≥65	1,429,463	Modified 2003 Beers' ID criteria	2003 Beers' PIP prevalence: 14.7%
Ryan <i>et al.</i> '09 ^[73]	Observational	Ireland	Europe	Community dwelling ≥65	1,329	2003 Beers' criteria 2008 STOPP criteria 2008 START criteria	2003 Beers' criteria PIP prevalence: 18.3% 2008 STOPP criteria PIP prevalence: 21.4% 2008 START criteria PPO prevalence: 22.7%
Bongue <i>et al.</i> '09 ^[74]	Observational	France	Europe	Community dwelling ≥65	30,683	Modified 1997 Beers' ID criteria 2001 French list of PIP criteria (Based on the 1997 Beers' ID criteria)	Modified 1997 Beers' ID criteria PIP prevalence rate: 10.1% 2001 French list of PIP criteria prevalence rate : 25.4%
Lapi <i>et al.</i> '09 ^[75]	Observational	Italy	Europe	Community dwelling ≥65	568	Modified 1991 Beers' criteria	Modified 1991 Beers' criteria PIP prevalence: 9.1%
Ryan <i>et al.</i> '09 ^[76]	Observational	Ireland	Europe	Community dwelling ≥65	500	2003 Beers' criteria 2000 IPET criteria	2003 Beers' criteria PIP prevalence: 13% 2000 IPET criteria PIP prevalence: 10.4%
Lai <i>et al.</i> '09 ^[77]	Observational	Taiwan	Asia	Hospital ≥65	8,213,147	Modified Taiwanese 2003 Beers' ID criteria	Modified Taiwanese 2003 Beers' ID PIP prevalence: 63.8% over the study period.
Steinman <i>et al.</i> '09 ^[78]	Observational	US	US	Community dwelling ≥65	256	2003 Beers' criteria 2001 Zhan criteria	2003 Beers' criteria PIP prevalence: 53% 2001 Zhan criteria PIP prevalence: 28%
Buck <i>et al.</i> '09 ^[79]	Observational	US	US	Community dwelling ≥65	61,251	2003 Beers' ID criteria 2001 Zhan criteria.	2003 Beers' ID criteria PIP prevalence: Centre 1: 8693 (23.3%) Centre 2: 5528 (23.0%) 2001 Zhan criteria PIP prevalence: Centre 1: 6036 (16.2%) Centre 2: 4160 (17.3%)
Mansur <i>et al.</i> '09 ^[80]	Observational	Israel	Asia	Hospital ≥65	212	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: At admission: 43.5% At discharge: 44.4%
Hale <i>et al.</i> '08 ^[81]	Observational	US	US	Hospital ≥65	100	2003 Beers' criteria	2003 Beers' criteria PIP prevalence Before admission: 39% During hospitalization: 59% At discharge: 41%
Wawruch <i>et al.</i> '08 ^[82]	Observational	Slovakia	Europe	Hospital ≥65	600	Modified 2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 21%
Prudent <i>et al.</i> '08 ^[83]	Observational	France	Europe	Hospital ≥75	1,176	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 28.2%

Gallagher <i>et al.</i> '08 ^[84]	Observational	Ireland	Europe	Hospital ≥ 65	715	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 35% 2003 Beers' criteria PIP prevalence: 25%
Schuler <i>et al.</i> '08 ^[85]	Observational	Austria	Europe	Hospital ≥ 75	543	Modified 2003 Beers' criteria	Modified 2003 Beers' criteria PIP prevalence: 30.1%
Carey <i>et al.</i> '08 ^[86]	Observational	UK	Europe	Community dwelling ≥ 65	218,567	Modified 2003 Beers' criteria	2003 Beers' PIP prevalence: 1996: 32.2% 2005: 28.3%
Hosia-Randell <i>et al.</i> '08 ^[87]	Observational	Finland	Europe	Long term care ≥ 65	1,987	Modified 2003 Beers' ID criteria	2003 Beers' PIP prevalence: 34.9%
Radozevic <i>et al.</i> '08 ^[88]	Observational	Croatia	Europe	Hospital ≥ 65	225	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence rate: 22%
Lin <i>et al.</i> '08 ^[90]	Observational	Taiwan	Asia	Hospital ≥ 65	5,741	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 23.7%
Gallagher <i>et al.</i> '08 ^[91]	Observational	Ireland	Europe	Hospital ≥ 65	597	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 32%
Rothberg <i>et al.</i> '08 ^[92]	Observational	US	US	Hospital ≥ 65	493,971	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 49% (ranged from 34-55%)
Budnitz <i>et al.</i> '07 ^[93]	Observational	US	US	Hospital ≥ 65	177,504	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 10.5%
Spinewine <i>et al.</i> '07 ^[94]	Intervention	Belgium	Europe	Hospital ≥ 70	203	Modified 1997 Beers' ID criteria 1992 MAI 2001 ACOVE criteria	1997 Beers' PIP prevalence: 30% 1992 MAI PIP prevalence: 60% 2001 ACOVE criteria PIP prevalence: 78%
Rajska-Neumann <i>et al.</i> '07 ^[96]	Observational	Poland	Europe	Community dwelling ≥ 65	1,000	1997 Beers' ID criteria	1997 Beers' ID criteria PIP prevalence: Overall: 28.3 Poznan: 28.6% Glogow: 27.2%
Fick <i>et al.</i> '07 ^[98]	Observational	US	US	Community dwelling ≥ 65	17,971	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 40.7%
Nixdorff <i>et al.</i> '07 ^[99]	Observational	US	US	Hospital ≥ 65	124	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 29%
Mandavi <i>et al.</i> '07 ^[101]	Observational	India	Asia	Hospital ≥ 60	515	Modified 2003 Beers' Criteria	2003 Beers' criteria PIP prevalence: 17.9%
Steinman <i>et al.</i> '07 ^[102]	Observational	US	US	Community dwelling ≥ 65	196	2003 Beers' criteria 1992 MAI	2003 Beers' criteria PIP prevalence: 37% 1992 MAI PIP prevalence: 82%
Hustey <i>et al.</i> '07 ^[103]	Observational	US	US	Hospital ≥ 65	352	2003 Beers' Criteria 2003	2003 Beers' criteria PIP prevalence: 32%
Landi <i>et al.</i> '07 ^[104]	Observational	Italy	Europe	Community dwelling ≥ 80	364	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 26%
Roughead <i>et al.</i> '07 ^[106]	Observational	Australia	Australia	Community Dwelling ≥ 70	192,363	Combined criteria (Modified 2003 Beers' ID criteria and	Combined criteria PIP prevalence: 21.2%

						modified 1997 McLeod criteria)	
De Wilde <i>et al.</i> '07 [107]	Observational	UK	Europe	Mixed dataset ≥ 65	162,000	Modified 2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 2003: 32.2% (20.5% on high risk medications) 1994: 32.9% (21.4% on high risk medications)
Fahlman <i>et al.</i> '07 [108]	Observational	US	US	Community dwelling ≥ 65	4,602	1997 Beers' ID criteria	1997 Beers' ID criteria PIP prevalence: 44%
Fu <i>et al.</i> '07 [110]	Observational	US	US	Community dwelling ≥ 65	720	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 15.97%
Cannon <i>et al.</i> '06 [111]	Observational	US	US	Hospital ≥ 65	786	Modified 1997 Beers' ID criteria	1997 Beers' PIP prevalence: 31%
De Oliveira Martins <i>et al.</i> '06 [112]	Observational	Portugal	Europe	Community dwelling ≥ 65	213	1997 Beers' ID criteria 2003 Beers' ID criteria	1997 Beers' criteria PIP prevalence: 27.7% 2003 Beers' criteria PIP prevalence: 38.5%
Franic <i>et al.</i> '06 [113]	Observational	US	US	Community dwelling ≥ 65	444	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 16.7%
Niwata <i>et al.</i> '06 [114]	Observational	Japan	Asia	Long term care ≥ 65	1,669	Modified 2003 Beers' criteria	Modified 2003 Beers' criteria PIP prevalence: 21.1%
Saab <i>et al.</i> '06 [115]	Observational	Lebanon	Asia	Community dwelling ≥ 65	350	2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 22.4%
Raivio <i>et al.</i> '06 [116]	Observational	Finland	Europe	Mixed dataset ≥ 70	425	Modified Finnish 1997 Beers' ID criteria	Modified Finnish 1997 Beers' ID criteria PIP prevalence: 36.2%
Egger <i>et al.</i> '06 [117]	Observational	Switzerland	Europe	Hospital ≥ 65	800	Modified Swiss 2003 Beers' criteria	Modified Swiss 2003 Beers' criteria PIP prevalence: Medical ward: Admission: 16.0% Discharge: 13.3% Geriatric ward Admission: 20.8%, Discharge: 15.9%
Barry <i>et al.</i> '06 [118]	Observational	Ireland	Europe	Hospital ≥ 65	350	2003 Beers' criteria 2000 IPET	2003 Beers' PIP prevalence: 34.6% 2000 IPET PIP prevalence: 22%
Page <i>et al.</i> '06 [119]	Observational	US	US	Hospital ≥ 75	389	Modified 2003 Beers' ID criteria	2003 Beers' PIP prevalence: 27.5%
Maio <i>et al.</i> '06 [120]	Observational	Italy	Europe	Mixed dataset ≥ 65	849,425	Modified 2003 Beers' ID criteria	2003 Beers' PIP prevalence: 18%
Wawruch <i>et al.</i> '06 [121]	Observational	Slovakia	Europe	Hospital ≥ 65	600	2003 Beers' criteria	2003 Beers' PIP prevalence: Admission: 20.2% Discharge: 20%
Steinman <i>et al.</i> '06 [122]	Observational	US	US	Community dwelling ≥ 65	196	2003 Beers' criteria 1999 AOU criteria Modified 1992 MAI criteria (unnecessary drug use)	Modified 1992 MAI PIP prevalence: 57% 2003 Beers' criteria PIP prevalence: 37%

							1999 AOU criteria PPO prevalence: 64%
Maio <i>et al.</i> '06 ^[125]	Observational	US	US	Community dwelling ≥ 65	100	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: Family Practice: 22% Senior citizens centre: 26%
Ay <i>et al.</i> '05 ^[127]	Observational	Turkey	Asia	Community dwelling ≥ 70	1,019	Modified Turkish 1997 Beers' ID criteria	Modified Turkish 1997 Beers' ID criteria PIP prevalence: 9.8%
Perri <i>et al.</i> '05 ^[128]	Observational	US	US	Long term care ≥ 65	1,117	1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence 46.5%
Roth <i>et al.</i> '05 ^[131]	Observational	US	US	Community dwelling ≥ 60	100	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 34%
Azoulay <i>et al.</i> '05 ^[132]	Observational	Iran	Asia	Community dwelling ≥ 65	3,000	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: 27.6%
Klarin <i>et al.</i> '05 ^[133]	Observational	Sweden	Europe	Mixed dataset ≥ 75	785	Combined criteria (Modified 1997 Beers' criteria and modified 1997 McLeod criteria)	Combined criteria PIP prevalence: 18.6%
Lau <i>et al.</i> '05 ^[134]	Observational	US	US	Long term care ≥ 65	3,372	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 50.3%
Viswanathan <i>et al.</i> '05 ^[135]	Observational	US	US	Hospital ≥ 65	7,243	Modified 2003 Beers' ID criteria Modified 1997 Beers' ID criteria Modified 2001 Zhan criteria	Modified 2003 Beers' ID criteria PIP prevalence: 13.4% Modified 1997 Beers' ID criteria PIP prevalence: 8.8% Modified Zhan criteria PIP prevalence: 4.2%
Zuckerman <i>et al.</i> '05 ^[136]	Observational	US	US	Long term care ≥ 65	546	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: Before admission: Dementia: 20% Without dementia: 23% After admission: Before admission: Dementia: 19% Without dementia: 28%
Saltvedt <i>et al.</i> '05 ^[137]	Intervention	Norway	Europe	Hospital ≥ 75	254	1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: Patients in a geriatric evaluation and management unit: 10% Patients in a general medical ward: 9%
Van der Hooft <i>et al.</i> '05 ^[138]	Observational	Netherlands	Europe	Hospital ≥ 65	120,218	1997 Beers' criteria 2003 Beers criteria	1997 Beers' criteria PIP prevalence: 16.8%-18.5% 2003 Beers' criteria PIP prevalence: 19.1%-20.0%
Rigler <i>et al.</i> '05 ^[140]	Observational	US	US	Mixed dataset ≥ 60	3,185	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: Ambulatory care patients: 21%, Patients in the Kansas Frail Elderly Program :48% Older nursing home residents: 38%
Onder <i>et al.</i> '05 ^[141]	Observational	US	US	Hospital ≥ 65	5,152	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 28.6%

Chang <i>et al.</i> '05 ^[142]	Observational	US	US	Community dwelling ≥65	550	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 11.6%
Fialova <i>et al.</i> '05 ^[143]	Observational	Europe-Metropolitan areas of the Czech Republic, Denmark, Finland, Iceland, Italy, the Netherlands, Norway, and the United Kingdom.	Europe	Community dwelling ≥65	2,707	Modified 1997 Beers' ID criteria Modified 2003 Beers' ID criteria Modified 1997 McLeod criteria	Overall: Combination of all 3 tools PIP prevalence rate: 19.8 Modified 1997 Beers' ID criteria PIP prevalence: 3.3-17.1% Modified 2003 Beers' ID criteria PIP prevalence: 5.8-25.2% Modified 1997 McLeod criteria PIP prevalence: 3.0-31.8%
Howard <i>et al.</i> '04 ^[144]	Observational	Canada	Canada	Community dwelling ≥65	777	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: 16.3%
Mamun <i>et al.</i> '04 ^[145]	Observational	Singapore	Asia	Long term care ≥65	454	Modified 1997 Beers' criteria	Modified 1997 Beers' criteria PIP prevalence: 70.04%
Chetty <i>et al.</i> '04 ^[146]	Observational	South Africa	Africa	Mixed dataset ≥65	6,410	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence rate: 30.0%
Rigler <i>et al.</i> '04 ^[147]	Observational	US	US	Mixed dataset ≥65	3,185	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: Ambulatory care patients: 21%, Patients in the Kansas Frail Elderly Program :48% Older nursing home residents: 38%
Brown <i>et al.</i> '04 ^[148]	Observational	US	US	Hospital ≥65	99	1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence rate: 10.1%
Curtis <i>et al.</i> '04 ^[149]	Observational	US	US	Community dwelling ≥65	765,423	Modified 1997 Beers' ID criteria	Modified 1997 Beers' criteria PIP prevalence rate: 21.2%
Fillenbaum <i>et al.</i> '04 ^[150]	Observational	US	US	Community dwelling ≥68	3,165	2002 DUR criteria 1997 Beers' ID criteria	2002 DUR PIP prevalence: 21.3% 1997 Beers' ID criteria PIP prevalence: 27.9%
Caterino <i>et al.</i> '04 ^[151]	Observational	US	US	Hospital ≥65	33,395	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: 12.6%
Lau <i>et al.</i> '04 ^[152]	Observational	US	US	Long term care ≥65	3,372	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 50%
Chang <i>et al.</i> '04 ^[153]	Observational	Taiwan	Asia	Community dwelling ≥65	882	1997 Beers' criteria	1997 Beers' PIP prevalence: 10.5%
Goulding <i>et al.</i> '04 ^[154]	Observational	US	US	Hospital ≥65	22,031	Modified 1997 Beers' ID criteria Modified 2001 Zhan criteria	Modified 1997 Beers' criteria PIP prevalence: 7.6-7.8% Modified 2001 Zhan criteria PIP prevalence: 3.7-3.8
Rhoads <i>et al.</i> '03	Intervention	US	US	Long term care ≥65	456	Modified 1997 Beers' ID	Modified 1997 Beers' ID criteria PIP prevalence:

[157]						criteria	31.6%
Gray <i>et al.</i> '03 [158]	Observational	US	US	Long term care ≥ 65	282	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: Baseline: 22% Over a one year period: 43.7%
Heininger-Rothbucher <i>et al.</i> '03 [159]	Observational	Austria	Europe	Hospital ≥ 60	195	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 12.3%
Onder <i>et al.</i> '03 [160]	Observational	Italy	Europe	Hospital ≥ 65	5,734	Modified 1997 Beers' ID criteria	1997 Beers' PIP prevalence: 14.6%
Stuart <i>et al.</i> '03 [161]	Observational	US	US	Community dwelling ≥ 65	20244	Modified 1997 Beers' ID criteria	1997 Beers' Criteria PIP prevalence: 1995 CD: 24.8% 1995 DMB: 31.1% 1999 CD: 21.3% 1999 DMB: 31.5%
Edwards <i>et al.</i> '03 [162]	Observational	US	US	Hospital ≥ 65	349	1997 Beers' criteria	1997 Beers' criteria high severity PIP prevalence: 11.1-12.7% ACE unit: 11.1% General medicine: 12.7%
Pitkala <i>et al.</i> '02 [163]	Observational	Finland	Europe	Mixed dataset ≥ 65	2,511	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 12.5%
Dhall <i>et al.</i> '02 [164]	Observational	US	US	Long term care ≥ 65	44,562	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: Admission: 33% After 90 days: 31%
Hanlon <i>et al.</i> '02 [166]	Observational	US	US	Community dwelling ≥ 65	2,451	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: 28%
Dhalla <i>et al.</i> '02 [167]	Observational	US	US	Long term care ≥ 65	19,911	Modified 1997 Beers' ID criteria	1997 Beers' PIP prevalence: At admission: 25.4% At discharge: 20.8%
Sloane <i>et al.</i> '02 [168]	Observational	US	US	Long term care ≥ 65	2,014	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: 16.0%
Spiker <i>et al.</i> '01 [169]	Intervention	US	US	Community dwelling ≥ 65	146	Modified 1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 35.6%
Piecoro <i>et al.</i> '00 [172]	Observational	US	US	Mixed dataset ≥ 65	64,832	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: Combined: 27% Nursing home elders: 33.2% Community dwelling elders: 24.4%
Chin <i>et al.</i> '99 [174]	Observational	US	US	Community dwelling ≥ 65	898	Modified 1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 14.8%
Golden <i>et al.</i> '99 [175]	Observational	US	US	Community dwelling ≥ 60	2,193	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: 39.7%
Anderson <i>et al.</i> '97 [177]	Observational	Canada	Canada	Community dwelling ≥ 65	355,600	Modified 1991 Beers' criteria	Modified 1991 Beers' criteria PIP prevalence: 22%

Wilcox <i>et al.</i> '94 ^[178]	Observational	US	US	Community dwelling ≥65	6,171	Modified 1991 Beers' criteria	Modified 1991 Beers' criteria PIP prevalence: 28.7%
Stuck <i>et al.</i> '94 ^[179]	Observational	US	US	Community dwelling ≥75	414	Modified 1991 Beers' criteria	Modified 1991 Beers' criteria PIP prevalence: 14%
Beers <i>et al.</i> '92 ^[180]	Observational	US	US	Long term care ≥65	1,106	1991 Beers' Criteria	1991 Beers' Criteria PIP prevalence: 40.3%

Beers criteria PIP prevalence: 2.8-70.0%

2003 Beers' Criteria

Table 2.16. Summary table of studies which have used the 2003 Beers' Criteria in older individuals

	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
O'Sullivan <i>et al.</i> '13 ^[1]	Observational	Ireland	Europe	Long term care ≥65	732	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 70.0% 2003 Beers' criteria PIP prevalence: 53.4%
Vishwas <i>et al.</i> '12 ^[2]	Observational	India	Asia	Hospital ≥60	540	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 13.3% 2003 Beers' criteria PIP prevalence: 24.6%
Chen <i>et al.</i> '12 ^[3]	Observational	Malaysia	Asia	Long term care ≥65	211	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 23.7% 2003 Beers' criteria PIP prevalence: 32.7%
Oliveira <i>et al.</i> '12 ^[7]	Observational	Brazil	South America	Community dwelling ≥60	139	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 34.5%
Yasein <i>et al.</i> '12 ^[8]	Observational	Jordan	Asia	Hospital ≥65	400	2003 Beers' criteria	2003 Beers' ID criteria PIP prevalence: 29.5% 2003 Beers' CD criteria PIP prevalence: 7.0%
Ubeda <i>et al.</i> '12 ^[10]	Observational	Spain	Europe	Long term care ≥65	81	2008 STOPP criteria 2008 START criteria 2003 Beers criteria	Combined criteria PIP prevalence: 64.0% 2008 STOPP PIP prevalence: 48.0%. 2003 Beers' criteria PIP prevalence: 25.0%. 2008 START PPO prevalence: 44.0%..
Al-Omar <i>et al.</i> '12 ^[15]	Observational	Saudi Arabia	Asia	Hospital ≥65	2,052	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 29.5%
Fouquet <i>et al.</i> '12 ^[17]	Observational	France	Europe	Hospital ≥75	150	2003 French modified Beers' criteria 2000 Modified IPET criteria	Combined criteria PIP prevalence: 26.7% 2003 French modified Beers' criteria PIP prevalence: 24.0%. 2000 Modified IPET criteria PIP prevalence: 9.3%.
Shah <i>et al.</i> '12 ^[18]	Observational	UK	Europe	Mixed dataset ≥65	Nursing Home (NH)-10, 387 Community dwelling (CD)-403,259	Modified 2003 Beers' criteria	Modified 2003 Beers' criteria PIP prevalence: Nursing Home: 33.0% Community dwelling: 21.4%
Goltz <i>et al.</i> '11 ^[20]	Observational	Germany	Europe	Community dwelling ≥65	2003-12,513,584 2004-10,126,809	Modified 2003 Beers' criteria	Modified 2003 Beers' criteria PIP prevalence: 2003: 21.7% 2004: 18.2%
Gopinath <i>et al.</i> '11 ^[23]	Observational	India	Asia	Hospital ≥65	170	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 45.3 %
Widagdo <i>et al.</i>	Observational	Australia	Australia	Hospital ≥65	100	2003 Beers' criteria (high	2003 Beers' criteria PIP prevalence:

'11 ^[24]						severity)	Admission: 42% Discharge:39%
Dunn <i>et al.</i> '11 ^[25]	Intervention	US	US	Community dwelling ≥65	120	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 37.5%
Bao <i>et al.</i> '11 ^[26]	Observational	US	US	Community dwelling ≥65	3,124	Modified 2003 Beers' ID criteria	Modified 2003 Beers' criteria PIP prevalence: 38%
Lund <i>et al.</i> '11 ^[27]	Intervention	US	US	Community dwelling ≥65	407	1997 Beers' criteria 2003 Beers' criteria	1997 Beers' criteria PIP prevalence in the PCM patients: 31.1% 2003 Beers' criteria PIP prevalence in the EPOC patients: 44.2%
Lin <i>et al.</i> '11 ^[28]	Observational	Taiwan	Asia	Community dwelling ≥65	327	Modified 2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 5% (90/327)
Woelfel <i>et al.</i> '11 ^[29]	Observational	US	US	Hospital ≥65	295	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 18%
Leikola <i>et al.</i> '11 ^[30]	Observational	Finland	Europe	Community dwelling ≥65	841,509	Modified Finnish 2003 Beers' ID criteria	Modified Finnish 2003 Beers' ID criteria PIP Prevalence:14.7% (n=123545)
Barnett <i>et al.</i> '11 ^[31]	Observational	UK	Europe	Mixed dataset ≥65	70,299	Modified UK 2003 Beers' ID criteria	Modified UK 2003 Beers' ID criteria PIP prevalence: Community dwelling: 30.9% Long term care: 37.1%
Stafford <i>et al.</i> '11 ^[32]	Observational	Australia	Australia	Long term care ≥65	2,345	2003 Beers' criteria 1997 McLeod criteria	Combined criteria PIP prevalence: 43.8% 2003 Beers' criteria PIP prevalence: 35.3% 1997 McLeod criteria PIP prevalence: 18.7%
Mandavi <i>et al.</i> '11 ^[33]	Observational	India	Asia	Community dwelling ≥60	1,081	Modified 2003 Beers' criteria	2003 Beers' PIP prevalence: 10.8%
Gallagher <i>et al.</i> '11 ^[34]	Observational	Europe	Europe	Hospital ≥65	900	2008 STOPP criteria 2008 START criteria 2003 Beers' criteria	Overall 2008 STOPP PIM prevalence: 51.3%. Ranging from 34.7- 77.3% Overall 2003 Beers' PIP prevalence: 30.4%. Ranging from 22.7-43.3%. Overall 2008 START PPO prevalence: 59.4%. Ranging from 51.3- 72.7%.
Luo <i>et al.</i> '11 ^[36]	Observational	Northern Ireland	Europe	Hospital ≥65	192	2003 Beers' criteria 2000 IPET 2006 HEDIS criteria	2003 Beers' criteria PIP prevalence: 25.1-30.7% 2000 IPET PIP prevalence: 19-27.4% 2006 HEDIS PIP prevalence: 5.6-9.7%
Ghadimi <i>et al.</i> '11 ^[40]	Observational	Iran	Asia	Community dwelling ≥65	2,041	Modified 2003 Beers' ID Criteria.	Modified 2003 Beers' ID criteria PIP prevalence: 30% (27% for men; 33% for women).

Sakuma <i>et al.</i> '11 ^[41]	Observational	Japan	Asia	Hospital ≥65	2,155	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 56.1%
Fiss <i>et al.</i> '11 ^[42]	Observational	Germany	Europe	Community dwelling ≥65	744	Modified German 2003 Beers' criteria	Modified German 2003 Beers' criteria PIP prevalence: 18%
Shah <i>et al.</i> '11 ^[43]	Observational	India	Asia	Hospital ≥65	400	2003 Beers' criteria 1998 Phadke's criteria of rationale prescribing	2003 Beers' criteria PIP prevalence: 27.25% 1998 Phadke's criteria of irrational prescribing prevalence: 28.3%
Hamilton <i>et al.</i> '11 ^[44]	Observational	Ireland	Europe	Hospital ≥65	600	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 56.2% 2003 Beers' criteria PIP prevalence: 28.8%
Golden <i>et al.</i> '11 ^[45]	Observational	US	US	Community dwelling ≥65	3,911	Modified 2003 Beers ID criteria (high risk medications)	Modified 2003 Beers' ID criteria PIP prevalence: 25.2%
Albert <i>et al.</i> '10 ^[46]	Observational	US	US	Community dwelling ≥65	7,459	Modified 2003 Beers' criteria 2006 HEDIS criteria	2003 Beers' criteria PIP prevalence: 53.5% 2006 HEDIS criteria PIP prevalence: 38.8%
Shiyanbola <i>et al.</i> '10 ^[47]	Observational	US	US	Community dwelling ≥65	874	2003 Beers' criteria Modified 2001 ACOVE criteria	2003 Beers' criteria PIP prevalence: 26.5% Modified 2001 ACOVE criteria PIP prevalence: 34.7% Combined criteria PIP prevalence: 45.8%
Lau <i>et al.</i> '10 ^[48]	Observational	US	US	Community dwelling ≥65	4,087	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 17% overall 15% in patients with dementia 20% in patients without dementia
Fu <i>et al.</i> '10 ^[49]	Observational	US	US	Community dwelling ≥65	1,774	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 2005: 20% 2006: 16%
Akazawa <i>et al.</i> '10 ^[50]	Observational	Japan	Asia	Community dwelling ≥65	6,628	Modified Japanese 2003 Beers' ID criteria	Modified Japanese 2003 Beers criteria PIP prevalence rate: 43.6%
Somers <i>et al.</i> '10 ^[51]	Observational	Belgium	Europe	Hospital ≥65	110	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: Admission: 20% Discharge: 16%
Harugeri <i>et al.</i> '10 ^[52]	Observational	India	Asia	Hospital ≥60	814	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 23.5%
Blozik <i>et al.</i> '10 ^[53]	Intervention	Switzerland	Europe	Long term care ≥60	181	Modified Beers' 2003 ID criteria	2003 Beers' criteria PIP prevalence: 14.5% pre-intervention 2.8% post-in intervention
Zaveri <i>et al.</i> '10 ^[54]	Observational	India	Asia	Hospital ≥65	407	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 23.59%
Kamuhabwa <i>et al.</i> '10 ^[55]	Observational	Tanzania	Africa	Hospital ≥65	514	Modified 2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 11.4%
Maio <i>et al.</i> '10 ^[56]	Observational	Italy	Europe	Community dwelling ≥65	91,741	Modified 2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 25.8%
Conejos Miquel <i>et al.</i> '10 ^[57]	Observational	Spain	Europe	Mixed dataset ≥65	150	2003 Beers' criteria 2008 STOPP criteria	Primary Care 2003 Beers' criteria PIP prevalence: 24%

						2008 START criteria	2008 STOPP criteria PIP prevalence: 36% 2008 START criteria PIP prevalence: 28% Secondary Care 2003 Beers' criteria PIP prevalence: 26% 2008 STOPP PIP prevalence: 54% 2008 START PIP prevalence: 54% Nursing Home Care 2003 Beers' criteria PIP prevalence: 20% 2008 STOPP criteria PIP prevalence: 50% 2008 START criteria PIP prevalence: 46%
Ruggiero <i>et al.</i> '10 ^[58]	Observational	Italy	Europe	Long term care ≥65	1,716	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 48%
Lund <i>et al.</i> '10 ^[61]	Observational	US	US	Community dwelling ≥65	240	2003 Beers' criteria 1992 MAI	2003 Beers' criteria PIP prevalence: 48.7% MAI prevalence: 54.3%
Castelino <i>et al.</i> '10 ^[62]	Observational	Australia	Australia	Community dwelling ≥65	372	2003 Beers' criteria 2007 DBI	2003 Beers' criteria PIP prevalence: 39.8% 2007 DBI PIP prevalence: 60.5%
Pattanworasate <i>et al.</i> '10 ^[65]	Observational	Australia	Australia	Hospital ≥65	202	Modified Australian 2003 Beers' criteria Modified Australian 1997 McLeod criteria Modified 2006 NPS criteria	Combined criteria PIP prevalence: 55% Modified Australian 2003 Beers' criteria PIP prevalence: 44% Modified Australian 1997 McLeod criteria PIP prevalence: 41% Modified 2006 NPS criteria PIP prevalence: 16%
Dedhiya <i>et al.</i> '10 ^[66]	Observational	US	US	Long term care ≥65	7,594	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 42.1%.
Ruggiero <i>et al.</i> '09 ^[68]	Observational	Italy	Europe	Long term care ≥65	496	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 27.7%
Corsonello <i>et al.</i> '09 ^[70]	Observational	Italy	Europe	Hospital ≥65	506	2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 20.6%
Berdot <i>et al.</i> '09 ^[71]	Observational	France	Europe	Community dwelling ≥65	6,343	Combined criteria (Modified 1997 Beers' ID criteria and modified 2003 Beers' ID criteria and La Roche criteria)	Combined criteria PIP prevalence: 31.6%
Chen <i>et al.</i> '09 ^[72]	Observational	Taiwan	Asia	Hospital ≥65	1,429,463	Modified 2003 Beers' ID criteria	2003 Beers' PIP prevalence: 14.7%
Ryan <i>et al.</i> '09 ^[73]	Observational	Ireland	Europe	Community dwelling ≥65	1,329	2003 Beers' criteria 2008 STOPP criteria 2008 START criteria	2003 Beers' criteria PIP prevalence: 18.3% 2008 STOPP criteria PIP prevalence: 21.4%

							2008 START criteria PPO prevalence: 22.7%
Ryan <i>et al.</i> '09 ^[76]	Observational	Ireland	Europe	Community dwelling ≥65	500	2003 Beers' criteria 2000 IPET	2003 Beers' criteria PIP prevalence: 13% 2000 IPET criteria PIP prevalence: 10.4%
Lai <i>et al.</i> '09 ^[77]	Observational	Taiwan	Asia	Hospital ≥65	8,213,147	Modified Taiwanese 2003 Beers' ID criteria	Modified Taiwanese 2003 Beers' ID criteria PIP prevalence: 63.8% over the study period
Steinman <i>et al.</i> '09 ^[78]	Observational	US	US	Community dwelling ≥65	256	2003 Beers' criteria 2001 Zhan criteria	2003 Beers' criteria PIP prevalence: 53% 2001 Zhan criteria PIP prevalence: 28%
Buck <i>et al.</i> '09 ^[79]	Observational	US	US	Community dwelling ≥65	61,251	2003 Beers' ID criteria 2001 Zhan criteria.	2003 Beers' ID criteria PIP prevalence: Centre 1: 8693 (23.3%) Centre 2: 5528 (23.0%) 2001 Zhan criteria PIP prevalence: Centre 1: 6036 (16.2%) Centre 2: 4160 (17.3%)
Mansur <i>et al.</i> '09 ^[80]	Observational	Israel	Asia	Hospital ≥65	212	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: At admission: 43.5% At discharge: 44.4%
Hale <i>et al.</i> '08 ^[81]	Observational	US	US	Hospital ≥65	100	2003 Beers' criteria	2003 Beers' criteria PIP prevalence Before admission: 39% During hospitalization: 59% At discharge: 41%
Wawruch <i>et al.</i> '08 ^[82]	Observational	Slovakia	Europe	Hospital ≥65	600	Modified 2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 21%
Prudent <i>et al.</i> '08 ^[83]	Observational	France	Europe	Hospital ≥75	1,176	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 28.2%
Gallagher <i>et al.</i> '08 ^[84]	Observational	Ireland	Europe	Hospital ≥65	715	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP PIP prevalence: 35% 2003 Beers' criteria PIP prevalence: 25%
Schuler <i>et al.</i> '08 ^[85]	Observational	Austria	Europe	Hospital ≥75	543	Modified 2003 Beers' criteria	Modified 2003 Beers' criteria PIP prevalence: 30.1%
Carey <i>et al.</i> '08 ^[86]	Observational	UK	Europe	Community dwelling ≥65	218,567	Modified 2003 Beers' criteria	2003 Beers' PIP prevalence: 1996: 32.2% 2005: 28.3%
Hosia-Randell <i>et al.</i> '08 ^[87]	Observational	Finland	Europe	Long term care ≥65	1,987	Modified 2003 Beers' ID criteria	2003 Beers' PIP prevalence: 34.9%
Radozevic <i>et al.</i> '08 ^[88]	Observational	Croatia	Europe	Hospital ≥65	225	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 22%
Lin <i>et al.</i> '08 ^[90]	Observational	Taiwan	Asia	Hospital ≥65	5,741	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 23.7%
Gallagher <i>et al.</i> '08	Observational	Ireland	Europe	Hospital ≥65	597	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 32%

[91]							
Rothberg <i>et al.</i> '08 [92]	Observational	US	US	Hospital ≥ 65	493,971	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP prevalence: 49% (ranged from 34-55%)
Budnitz <i>et al.</i> '07 [93]	Observational	US	US	Hospital ≥ 65	177,504	Modified 2003 Beers' ID criteria	Modified 2003 Beers ID PIP prevalence: 10.5%
Fick <i>et al.</i> '07 [98]	Observational	US	US	Community dwelling ≥ 65	17,971	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 40.7%
Nixdorff <i>et al.</i> '07 [99]	Observational	US	US	Hospital ≥ 65	124	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 29%
Mandavi <i>et al.</i> '07 [101]	Observational	India	Asia	Hospital ≥ 60	515	Modified 2003 Beers' criteria	Modified 2003 Beers' criteria PIP prevalence: 17.9%
Steinman <i>et al.</i> '07 [102]	Observational	US	US	Community dwelling ≥ 65	196	2003 Beers' criteria 1992 MAI	2003 Beers' criteria PIP prevalence: 37% 1992 MAI PIP prevalence: 82%
Hustey <i>et al.</i> '07 [103]	Observational	US	US	Hospital ≥ 65	352	2003 Beers' Criteria 2003	2003 Beers' criteria PIP prevalence: 32%
Landi <i>et al.</i> '07 [104]	Observational	Italy	Europe	Community dwelling ≥ 80	364	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 26%
Roughead <i>et al.</i> '07 [106]	Observational	Australia	Australia	Community Dwelling ≥ 70	192,363	Combined criteria (Modified 2003 Beers' ID criteria and modified 1997 McLeod criteria)	Combined criteria PIP prevalence: 21.2%
De Wilde <i>et al.</i> '07 [107]	Observational	UK	Europe	Mixed dataset ≥ 65	162,000	Modified 2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 2003: 32.2% (20.5% on high risk medications) 1994: 32.9% (21.4% on high risk medications)
Fu <i>et al.</i> '07 [110]	Observational	US	US	Community dwelling ≥ 65	720	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: 15.97%
De Oliveira Martins <i>et al.</i> '06 [112]	Observational	Portugal	Europe	Community dwelling ≥ 65	213	1997 Beers' ID criteria 2003 Beers' ID criteria	1997 Beers' criteria PIP prevalence: 27.7% 2003 Beers' criteria PIP prevalence: 38.5%
Franic <i>et al.</i> '06 [113]	Observational	US	US	Community dwelling ≥ 65	444	Modified 2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 16.7%
Niwata <i>et al.</i> '06 [114]	Observational	Japan	Asia	Long term care ≥ 65	1,669	Modified 2003 Beers' criteria	Modified 2003 Beers' criteria PIP prevalence: 21.1%
Saab <i>et al.</i> '06 [115]	Observational	Lebanon	Asia	Community dwelling ≥ 65	350	2003 Beers' ID criteria	2003 Beers' criteria PIP prevalence: 22.4%
Egger <i>et al.</i> '06 [117]	Observational	Switzerland	Europe	Hospital ≥ 65	800	Modified Swiss 2003 Beers' criteria	Modified Swiss 2003 Beers' criteria PIP prevalence: Medical ward: Admission: 16.0% Discharge: 13.3% Geriatric ward Admission: 20.8%, Discharge: 15.9%
Barry <i>et al.</i> '06 [118]	Observational	Ireland	Europe	Hospital ≥ 65	350	2003 Beers' criteria	2003 Beers' PIP prevalence: 34.6%

						2000 IPET	2000 IPET PIP prevalence: 22%
Page <i>et al.</i> '06 ^[119]	Observational	US	US	Hospital ≥75	389	Modified 2003 Beers' ID criteria	2003 Beers' PIP prevalence: 27.5%
Maio <i>et al.</i> '06 ^[120]	Observational	Italy	Europe	Mixed dataset ≥65	849,425	Modified 2003 Beers' ID criteria	2003 Beers' PIP prevalence: 18%
Wawruch <i>et al.</i> '06 ^[121]	Observational	Slovakia	Europe	Hospital ≥65	600	2003 Beers' criteria	2003 Beers' PIP prevalence: Admission: 20.2% Discharge: 20%
Steinman <i>et al.</i> '06 ^[122]	Observational	US	US	Community dwelling ≥65	196	2003 Beers' criteria 1999 AOU criteria Modified 1992 MAI criteria (unnecessary drug use)	Modified 1992 MAI PIP prevalence: 57% 2003 Beers' criteria PIP prevalence: 37% 1999 AOU criteria PPO prevalence: 64%
Maio <i>et al.</i> '06 ^[125]	Observational	US	US	Community dwelling ≥65	100	2003 Beers' ID criteria	2003 Beers' ID criteria PIP prevalence: Family Practice: 22% Senior citizens centre: 26%
Roth <i>et al.</i> '05 ^[131]	Observational	US	US	Community dwelling ≥60	100	2003 Beers' criteria	2003 Beers' criteria PIP prevalence: 34%
Viswanathan <i>et al.</i> '05 ^[135]	Observational	US	US	Hospital ≥65	7,243	Modified 2003 Beers' ID criteria Modified 1997 Beers' ID criteria Modified 2001 Zhan criteria	Modified 2003 Beers' ID criteria PIP prevalence: 13.4% Modified 1997 Beers' ID criteria PIP prevalence: 8.8% Modified 2001 Zhan criteria PIP prevalence: 4.2%
Van der Hooft <i>et al.</i> '05 ^[138]	Observational	Netherlands	Europe	Hospital ≥65	120,218	1997 Beers' criteria 2003 Beers' criteria	1997 Beers' criteria PIP prevalence: 16.8%-18.5% 2003 Beers' criteria PIP prevalence: 19.1%-20.0%
Onder <i>et al.</i> '05 ^[141]	Observational	US	US	Hospital ≥65	5,152	Modified 2003 Beers' ID criteria	Modified 2003 Beers' ID criteria PIP: 28.6%
Fialova <i>et al.</i> '05 ^[143]	Observational	Europe-Czech Republic, Denmark, Finland, Iceland, Italy, the Netherlands, Norway, and the UK.	Europe	Community dwelling ≥65	2,707	Modified 1997 Beers' ID criteria Modified 2003 Beers' ID criteria Modified 1997 McLeod criteria	Overall: Combination of all 3 tools PIP prevalence rate: 19.8 Modified 1997 Beers' ID criteria PIP prevalence: 3.3-17.1% Modified 2003 Beers' ID criteria PIP prevalence: 5.8-25.2% Modified 1997 McLeod criteria PIP prevalence: 3.0-31.8%

2003 Beers criteria PIP prevalence: 2.8-63.8%

1997 Beers' Criteria

Table 2.17. Summary table of studies which have used the 1997 Beers' Criteria in older individuals

	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Lund <i>et al.</i> '11 ^[27]	Intervention	US	US	Community dwelling ≥65	407	1997 Beers' criteria 2003 Beers' criteria	1997 Beers' criteria PIP prevalence in the PCM patients: 31.1% 2003 Beers' criteria PIP prevalence in the EPOC patients: 44.2%
Berdot <i>et al.</i> '09 ^[71]	Observational	France	Europe	Community dwelling ≥65	6,343	Combined criteria (Modified 1997 Beers' ID criteria and modified 2003 Beers' ID criteria and La Roche criteria)	Combined criteria PIP prevalence: 31.6%
Bongue <i>et al.</i> '09 ^[74]	Observational	France	Europe	Community dwelling ≥65	30,683	Modified 1997 Beers' ID criteria 2001 French list of PIP criteria (Based on the 1997 Beers' ID criteria)	Modified 1997 Beers' ID criteria PIP prevalence rate: 10.1% 2001 French list of PIP criteria prevalence rate : 25.4%
Spinewine <i>et al.</i> '07 ^[94]	Intervention	Belgium	Europe	Hospital ≥70	203	Modified 1997 Beers' ID criteria 1992 MAI 2001 ACOVE criteria	1997 Beers' criteria PIP prevalence: 30% 1992 MAI PIP prevalence: 60% 2001 ACOVE criteria PIP prevalence: 78%
Rajska-Neumann <i>et al.</i> '07 ^[96]	Observational	Poland	Europe	Community dwelling ≥65	1,000	1997 Beers' ID criteria	1997 Beers' ID criteria PIP prevalence: Overall: 28.3 Poznan: 28.6% Glogow: 27.2%
Fahlman <i>et al.</i> '07 ^[108]	Observational	US	US	Community dwelling ≥65	4,602	1997 Beers' ID criteria	1997 Beers' ID criteria PIP prevalence: 44%
Cannon <i>et al.</i> '06 ^[111]	Observational	US	US	Hospital ≥65	786	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: 31%
De Oliveira Martins <i>et al.</i> '06 ^[112]	Observational	Portugal	Europe	Community dwelling ≥65	213	1997 Beers ID criteria 2003 Beers' ID criteria	1997 Beers' criteria PIP prevalence: 27.7% 2003 Beers' criteria PIP prevalence: 38.5%
Raivio <i>et al.</i> '06 ^[116]	Observational	Finland	Europe	Mixed dataset ≥70	425	Modified Finnish 1997 Beers' ID criteria	Modified Finnish 1997 Beers' ID criteria PIP prevalence: 36.2%
Ay <i>et al.</i> '05 ^[127]	Observational	Turkey	Asia	Community dwelling ≥70	1,019	Modified Turkish 1997 Beers' ID criteria	Modified Turkish 1997 Beers' ID criteria PIP prevalence: 9.8%
Perri <i>et al.</i> '05 ^[128]	Observational	US	US	Long term care ≥65	1,117	1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: 46.5%
Azoulay <i>et al.</i> '05 ^[132]	Observational	Iran	Asia	Community dwelling ≥65	3,000	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: 27.6%
Klarin <i>et al.</i> '05 ^[133]	Observational	Sweden	Europe	Mixed dataset ≥75	785	Combined criteria (Modified 1997 Beers' criteria and	Combined criteria PIP prevalence: 18.6%

						modified 1997 McLeod criteria)	
Lau <i>et al.</i> '05 ^[134]	Observational	US	US	Long term care ≥65	3,372	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 50.3%
Viswanathan <i>et al.</i> '05 ^[135]	Observational	US	US	Hospital ≥65	7,243	Modified 2003 Beers' ID criteria Modified 1997 Beers' ID criteria Modified 2001 Zhan criteria	Modified 2003 Beers' ID criteria PIP prevalence: 13.4% Modified 1997 Beers' ID criteria PIP prevalence: 8.8% Modified 2001 Zhan criteria PIP prevalence: 4.2%
Zuckerman <i>et al.</i> '05 ^[136]	Observational	US	US	Long term care ≥65	546	Modified 1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: Before admission: Dementia: 20% Without dementia: 23% After admission: Before admission: Dementia: 19% Without dementia: 28%
Saltvedt <i>et al.</i> '05 ^[137]	Intervention	Norway	Europe	Hospital ≥75	254	1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: Patients in a geriatric evaluation and management unit: 10% Patients in a general medical ward: 9%
Van der Hooft <i>et al.</i> '05 ^[138]	Observational	Netherlands	Europe	Hospital ≥65	120,218	1997 Beers' criteria 2003 Beers' criteria	1997 Beers' criteria PIP prevalence: 16.8%-18.5% 2003 Beers' criteria PIP prevalence: 19.1%-20.0%
Rigler <i>et al.</i> '05 ^[140]	Observational	US	US	Mixed dataset ≥60	3,185	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: Ambulatory care patients: 21%, Patients in the Kansas Frail Elderly Program :48% Older nursing home residents: 38%
Chang <i>et al.</i> '05 ^[142]	Observational	US	US	Community dwelling ≥65	550	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 11.6%
Fialova <i>et al.</i> '05 ^[143]	Observational	Europe-Metropolitan areas of the Czech Republic, Denmark, Finland, Iceland, Italy, the Netherlands, Norway, and the United Kingdom.	Europe	Community dwelling ≥65	2,707	Modified 1997 Beers' ID criteria Modified 2003 Beers' ID criteria Modified 1997 McLeod criteria	Overall: Combination of all 3 tools PIP prevalence rate: 19.8 Modified 1997 Beers' ID criteria PIP prevalence: 3.3-17.1% Modified 2003 Beers' ID criteria PIP prevalence: 5.8-25.2% Modified 1997 McLeod criteria PIP prevalence: 3.0-31.8%
Howard <i>et al.</i> '04	Observational	Canada	Canada	Community dwelling	777	Modified 1997 Beers' ID	Modified 1997 Beers' ID criteria PIP prevalence:

[144]				≥65		criteria	16.3%
Mamun <i>et al.</i> '04 [145]	Observational	Singapore	Asia	Long term care ≥65	454	Modified 1997 Beers' criteria	Modified 1997 Beers' criteria PIP prevalence: 70.04%
Chetty <i>et al.</i> '04 [146]	Observational	South Africa	Africa	Mixed dataset ≥65	6,410	Modified 1997 Beers' ID criteria	Modified 1997 Beers' criteria PIP prevalence: 30.0%
Rigler <i>et al.</i> '04 [147]	Observational	US	US	Mixed dataset ≥65	3,185	Modified 1997 Beers' ID criteria	Modified 1997 Beers' criteria PIP prevalence: Ambulatory care patients: 21%, Patients in the Kansas Frail Elderly Program :48% Older nursing home residents : 38%
Brown <i>et al.</i> '04 [148]	Observational	US	US	Hospital ≥65	99	1997 Beers' ID criteria	1997 Beers' criteria PIP prevalence: 10.1%
Curtis <i>et al.</i> '04 [149]	Observational	US	US	Community dwelling ≥65	765,423	Modified 1997 Beers' ID criteria	Modified 1997 Beers' criteria PIP prevalence: 21.2%
Fillenbaum <i>et al.</i> '04 [150]	Observational	US	US	Community dwelling ≥68	3,165	2002 DUR criteria 1997 Beers' ID criteria	2002 DUR PIP prevalence: 21.3% 1997 Beers' ID criteria PIP prevalence: 27.9%
Caterino <i>et al.</i> '04 [151]	Observational	US	US	Hospital ≥65	33,395	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: 12.6%
Lau <i>et al.</i> '04 [152]	Observational	US	US	Long term care ≥65	3,372	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 50%
Chang <i>et al.</i> '04 [153]	Observational	Taiwan	Asia	Community dwelling ≥65	882	1997 Beers' criteria	1997 Beers' PIP prevalence: 10.5%
Goulding <i>et al.</i> '04 [154]	Observational	US	US	Hospital ≥65	22,031	Modified 1997 Beers' ID criteria Modified 2001 Zhan criteria	Modified 1997 Beers' criteria PIP prevalence: 7.6- 7.8% Modified 2001 Zhan criteria PIP prevalence: 3.7- 3.8
Rhoads <i>et al.</i> '03 [157]	Intervention	US	US	Long term care ≥65	456	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: 31.6%
Gray <i>et al.</i> '03 [158]	Observational	US	US	Long term care ≥65	282	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: Baseline: 22% Over a one year period: 43.7%
Heininger- Rothbucher <i>et al.</i> '03 [159]	Observational	Austria	Europe	Hospital ≥60	195	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 12.3%
Onder <i>et al.</i> '03 [160]	Observational	Italy	Europe	Hospital ≥65	5,734	Modified 1997 Beers' ID criteria	Modified 1997 Beers' PIP prevalence: 14.6%
Stuart <i>et al.</i> '03 [161]	Observational	US	US	Community dwelling ≥65	20244	Modified 1997 Beers' ID criteria	Modified 1997 Beers' criteria PIP prevalence: 1995 CD: 24.8% 1995 DMB: 31.1% 1999 CD: 21.3% 1999 DMB: 31.5%
Edwards <i>et al.</i> '03 [162]	Observational	US	US	Hospital ≥65	349	1997 Beers' criteria	1997 Beers' criteria high severity PIP prevalence: 11.1-12.7% ACE unit: 11.1%

							General medicine:12.7%
Pitkala <i>et al.</i> '02 ^[163]	Observational	Finland	Europe	Mixed dataset ≥ 65	2,511	1997 Beers' criteria	1997 Beers' criteria PIP prevalence: 12.5%
Dhall <i>et al.</i> '02 ^[164]	Observational	US	US	Long term care ≥ 65	44,562	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: Admission: 33% After 90 days: 31%
Hanlon <i>et al.</i> '02 ^[166]	Observational	US	US	Community dwelling ≥ 65	2,451	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: 28%
Dhalla <i>et al.</i> '02 ^[167]	Observational	US	US	Long term care ≥ 65	19,911	Modified 1997 Beers' ID criteria	Modified 1997 Beers' criteria PIP prevalence: At admission: 25.4% At discharge: 20.8%
Sloane <i>et al.</i> '02 ^[168]	Observational	US	US	Long term care ≥ 65	2,014	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: 16.0%
Spiker <i>et al.</i> '01 ^[169]	Intervention	US	US	Community dwelling ≥ 65	146	Modified 1997 Beers' criteria	Modified 1997 Beers criteria PIP prevalence: 35.6%
Piecoro <i>et al.</i> '00 ^[172]	Observational	US	US	Mixed dataset ≥ 65	64,832	Modified 1997 Beers' ID criteria	Modified 1997 Beers' ID criteria PIP prevalence: Combined: 27% Nursing home elders: 33.2% Community dwelling elders: 24.4%
Chin <i>et al.</i> '99 ^[174]	Observational	US	US	Community dwelling ≥ 65	898	Modified 1997 Beers' criteria	Modified 1997 Beers' criteria PIP prevalence: 14.8%
Golden <i>et al.</i> '99 ^[175]	Observational	US	US	Community dwelling ≥ 60	2,193	Modified 1997 Beers' ID criteria	Modified 1997 Beers' criteria PIP prevalence: 39.7%

1997 Beers PIP prevalence: 3.3-70.0%

1991 Beers' Criteria

Table 2.18. Summary table of studies which have used the 1991 Beers' Criteria in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Pozzi <i>et al.</i> '10 ^[59]	Observational	Italy	Europe	Community dwelling ≥65	1,022	Modified 1991 Beers' criteria	Modified 1991 Beers' criteria PIP prevalence: 9%
Lapi <i>et al.</i> '09 ^[75]	Observational	Italy	Europe	Community dwelling ≥65	568	Modified 1991 Beers' criteria	Modified 1991 Beers' criteria PIP prevalence: 9.1%
Anderson <i>et al.</i> '97 ^[177]	Observational	Canada	Canada	Community dwelling ≥65	355,600	Modified 1991 Beers' criteria	Modified 1991 Beers' criteria PIP prevalence: 22%
Wilcox <i>et al.</i> '94 ^[178]	Observational	US	US	Community dwelling ≥65	6,171	Modified 1991 Beers' criteria	Modified 1991 Beers' criteria PIP prevalence: 28.7%
Stuck <i>et al.</i> '94 ^[179]	Observational	US	US	Community dwelling ≥75	414	Modified 1991 Beers' criteria	Modified 1991 Beers' criteria PIP prevalence: 14%
Beers <i>et al.</i> '92 ^[180]	Observational	US	US	Long term care ≥65	1,106	1991 Beers' Criteria	1991 Beers' Criteria PIP prevalence: 40.3%

1991 Beers PIP prevalence: 9-40.3%

Screening Tool of Older Persons' Prescriptions (STOPP) Criteria

Table 2.19. Summary table of studies which have used the STOPP Criteria in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
O'Sullivan <i>et al.</i> '13 ^[1]	Observational	Ireland	Europe	Long term care ≥65	732	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 70.0% 2003 Beers' criteria PIP prevalence: 53.4%
Vishwas <i>et al.</i> '12 ^[2]	Observational	India	Asia	Hospital ≥60	540	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 13.3% 2003 Beers' criteria PIP prevalence: 24.6%
Chen <i>et al.</i> '12 ^[3]	Observational	Malaysia	Asia	Long term care ≥65	211	2008 STOPP criteria 2003 Beers' criteria	2008 STOPP criteria PIP prevalence: 23.7% 2003 Beers' criteria PIP prevalence: 32.7%
Bradley <i>et al.</i> '12 ^[5]	Observational	Northern Ireland	Europe	Community dwelling ≥70	166,108	Modified 2008 STOPP criteria	Modified 2008 STOPP criteria PIP prevalence: 34.0%
Garcia-Gollarte <i>et al.</i> '12 ^[9]	Observational	Spain	Europe	Long term care ≥65	100	2008 STOPP criteria 2008 START criteria 2006 Australian criteria	2008 STOPP PIP prevalence: 79.0%. 2006 Australian PIP prevalence: 95.0%. 2008 START PPO prevalence: 74.0%..
Ubeda <i>et al.</i> '12 ^[10]	Observational	Spain	Europe	Long term care ≥65	81	2008 STOPP criteria 2008 START criteria 2003 Beers criteria	Combined criteria PIP prevalence: 64.0% 2008 STOPP PIP prevalence: 48.0%. 2003 Beers' criteria PIP prevalence: 25.0%. 2008 START PPO prevalence: 44.0%..
Ryan <i>et al.</i> '12 ^[11]	Observational	Ireland	Europe	Long term care ≥65	313	2008 STOPP criteria 2008 START criteria	2008 STOPP PIP prevalence: 59.8%. 2008 START PPO prevalence: 42.2%..
Dalleur <i>et al.</i> '12 ^[12]	Observational	Belgium	Europe	Hospital ≥75	302	2008 STOPP criteria 2008 START criteria	2008 STOPP PIP prevalence: 48.0%. 2008 START PPO prevalence: 63.0%..
Parsons <i>et al.</i> '12 ^[13]	Observational	UK	Europe	Long term care ≥65	133	Modified 2008 STOPP criteria	Modified 2008 STOPP criteria PIP prevalence: Time point 1: 46.2% Time point 2: 40.9%
Wahab <i>et al.</i> '12 ^[14]	Observational	Australia	Australia	Hospital ≥65	100	2008 STOPP criteria	2008 STOPP PIP prevalence: 60.0%.
Gallagher <i>et al.</i> '11 ^[34]	Observational	Europe	Europe	Hospital ≥65	900	2008 STOPP criteria 2008 START criteria 2003 Beers' criteria	Overall 2008 STOPP criteria PIP prevalence prevalence:51.3%. Ranging from 34.7- 77.3% Overall 2003 Beers' criteria PIP prevalence:30.4%. Ranging from 22.7-43.3%. Overall 2008 START PPO prevalence: 59.4%. Ranging from 51.3- 72.7%.

Liu <i>et al.</i> '11 ^[37]	Observational	Taiwan	Asia	Hospital ≥ 65	520	2008 STOPP criteria 2008 START criteria	2008 STOPP criteria PIP prevalence: 36.2% 2008 START criteria PPO prevalence: 41.9%.
Gallagher <i>et al.</i> '11 ^[38]	Intervention	Ireland	Europe	Hospital ≥ 65	400	2008 STOPP criteria 2008 START criteria 1992 MAI 1999 AOU criteria	2008 combined STOPP and START criteria combined prevalence: 58.4% 1992 MAI prevalence: 48% 1999 AOU criteria prevalence: 37%
Lang <i>et al.</i> '11 ^[39]	Intervention	Switzerland	Europe	Hospital ≥ 65	134	2008 STOPP criteria (French adaption) 2008 START criteria (French adaption)	2008 STOPP criteria PIP prevalence: Admission: 77.3% Discharge: 18.6% 2008 START criteria PPO prevalence: Admission: 64.7% Discharge: 11.2%
Hamilton <i>et al.</i> '11 ^[44]	Observational	Ireland	Europe	Hospital ≥ 65	600	STOPP criteria 2003 Beers' criteria	STOPP criteria PIP prevalence: 56.2% 2003 Beers' criteria PIP prevalence: 28.8%
Conejos Miquel <i>et al.</i> '10 ^[57]	Observational	Spain	Europe	Mixed dataset ≥ 65	150	2003 Beers' criteria 2008 STOPP criteria 2008 START criteria	Primary Care 2003 Beers' PIP prevalence: 24% 2008 STOPP criteria PIP prevalence: 36% 2008 START criteria PIP prevalence: 28% Secondary Care 2003 Beers' criteria PIP prevalence: 26% 2008 STOPP criteria PIP prevalence: 54% 2008 START criteria PIP prevalence: 54% Nursing Home Care 2003 Beers' criteria PIP prevalence: 20% 2008 STOPP criteria PIP prevalence: 50% 2008 START criteria PIP prevalence: 46%
Pyszka <i>et al.</i> '10 ^[60]	Observational	US	US	Hospital ≥ 70	111	Modified 2008 STOPP criteria 2008 START criteria	Modified 2008 STOPP criteria PIP prevalence: 65% at admission 64% at discharge 64% at follow-up 2008 START criteria PPO prevalence: 52% at admission 40% at discharge 35% at follow-up
Lang <i>et al.</i> '10 ^[63]	Observational	Switzerland	Europe	Hospital ≥ 65	150	2008 STOPP criteria (French adaption) 2008 START criteria (French adaption)	2008 STOPP criteria PIP prevalence: 77% START PPO RATE: 65%.

Cahir <i>et al.</i> '10 ^[64]	Observational	Ireland	Europe	Community dwelling ≥70	338,801	Modified 2008 STOPP criteria	Modified STOPP criteria PIP prevalence: 36% (121 454 claimants)
Ryan <i>et al.</i> '09 ^[73]	Observational	Ireland	Europe	Community dwelling ≥65	1,329	2003 Beers criteria 2008 STOPP criteria 2008 START criteria	2003 Beers criteria PIP prevalence: 18.3% 2008 STOPP criteria PIP prevalence: 21.4% 2008 START criteria PPO prevalence: 22.7%
Gallagher <i>et al.</i> '08 ^[84]	Observational	Ireland	Europe	Hospital ≥65	715	2008 STOPP criteria 2003 Beers criteria	2008 STOPP criteria PIP prevalence: 35% 2003 Beers criteria PIP prevalence: 25%

STOPP PIP prevalence: 13.3- 79.0%

ID; Independent of diagnosis CD; Considering diagnosis

Medication Appropriateness Index (MAI)

Table 2.20. Summary table of studies which have used the MAI Criteria in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Gallagher <i>et al.</i> '11 ^[38]	Intervention	Ireland	Europe	Hospital ≥65	400	2008 STOPP criteria 2008 START criteria 1992 MAI 1999 AOU criteria	Combined 2008 STOPP and START criteria combined prevalence: 58.4% 1992 MAI PIP prevalence: 48% 1999 AOU criteria PPO prevalence: 37%
Bergkvist <i>et al.</i> '09 ^[69]	Intervention	Sweden	Europe	Hospital ≥65	53	1992 MAI	1992 MAI PIP prevalence: Admission: Controls: 96% Intervention: 86% Discharge: Controls: 96% Intervention: 79%
Spinewine <i>et al.</i> '07 ^[94]	Intervention	Belgium	Europe	Hospital ≥70	203	Modified 1997 Beers' ID criteria 1992 MAI 1999 ACOVE criteria	1997 Beers' PIP prevalence: 30% 1992 MAI PIP prevalence: 60% 2001 ACOVE criteria PIP prevalence: 78%
Rossi <i>et al.</i> '07 ^[97]	Observational	US	US	Community dwelling ≥60	128	Modified 1992 MAI criteria (unnecessary drug use)	Modified 1992 MAI unnecessary medication prevalence: 58.6%
Steinman <i>et al.</i> '07 ^[102]	Observational	US	US	Community dwelling ≥65	196	2003 Beers' criteria 1992 MAI	2003 Beers' criteria PIP prevalence: 37% 1992 MAI PIP prevalence: 82%
Bregnhøj <i>et al.</i> '07 ^[105]	Observational	Denmark	Europe	Community dwelling >65	212	MAI	1992 MAI PIP prevalence: 94.3%
Steinman <i>et al.</i> '06 ^[122]	Observational	US	US	Community dwelling ≥65	196	2003 Beers' criteria 1999 AOU criteria Modified 1992 MAI criteria (unnecessary drug use)	Modified 1992 MAI PIP prevalence: 57% 2003 Beers' criteria PIP prevalence: 37% 1999 AOU criteria PPO prevalence: 64%
Hajjar <i>et al.</i> '05 ^[129]	Observational	US	US	Hospital ≥65	384	Modified 1992 MAI criteria (unnecessary drug use)	Modified 1992 MAI unnecessary drug use prevalence: 44%
Hanlon <i>et al.</i> '04 ^[155]	Observational	US	US	Hospital ≥65	397	Modified 1992 MAI (≥1 medications with MAI criteria rated as inappropriate)	Modified 1992 MAI PIP prevalence: 91.9%

MAI PIP prevalence: 44-96%

MAI; Medication Appropriateness Index

ID; Independent of diagnosis

IPET; The Improved Prescribing in the Elderly Tool

HEDIS; Health Plan Employer Data and Information Set

Zhan Criteria

Table 2.21. Summary table of studies which have used the Zhan Criteria in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Steinman <i>et al.</i> '09 ^[78]	Observational	US	US	Community dwelling ≥65	256	2003 Beers' criteria 2001 Zhan criteria	2003 Beers' criteria PIP prevalence: 53% 2001 Zhan criteria PIP prevalence: 28%
Buck <i>et al.</i> '09 ^[79]	Observational	US	US	Community dwelling ≥65	61,251	2003 Beers' ID criteria 2001 Zhan criteria.	2003 Beers' ID criteria PIP prevalence: Centre 1: 8693 (23.3%) Centre 2: 5528 (23.0%) 2001 Zhan criteria PIP prevalence: Centre 1: 6036 (16.2%) Centre 2: 4160 (17.3%)
Pugh <i>et al.</i> '08 ^[89]	Observational	US	US	Mixed dataset ≥65	850,154	2001 Zhan criteria	2001 Zhan criteria PIP prevalence: 26.2%
Bierman <i>et al.</i> '07 ^[109]	Observational	US	US	Community dwelling ≥65	965,756	Modified 2001 Zhan criteria	Modified 2001 Zhan criteria PIP prevalence: Men: 25.7% Women: 31%
Barnett <i>et al.</i> '06 ^[124]	Observational	US	US	Community dwelling ≥65	281150	2001 Zhan criteria	2001 Zhan criteria PIP prevalence: Veterans Administration: 21.3% Health maintenance organization: 28.8%
Viswanathan <i>et al.</i> '05 ^[135]	Observational	US	US	Hospital ≥65	7,243	Modified 2003 Beers' ID criteria Modified 1997 Beers' ID criteria Modified 2001 Zhan criteria	Modified 2003 Beers' ID criteria PIP prevalence: 13.4% Modified 1997 Beers' ID criteria PIP prevalence: 8.8% Modified Zhan criteria PIP prevalence: 4.2%
Pugh <i>et al.</i> '05 ^[139]	Observational	US	US	Mixed dataset ≥65	1,265,434	Modified 2001 Zhan criteria (including 2003 Beers criteria relating to medications considered potentially inappropriate based on dose)	Modified 2001 Zhan criteria PIP prevalence: 23%
Goulding <i>et al.</i> '04 ^[154]	Observational	US	US	Hospital ≥65	22,031	Modified 1997 Beers' ID criteria Modified 2001 Zhan criteria	Modified 1997 Beers' criteria PIP prevalence: 7.6-7.8% Modified 2001 Zhan criteria PIP prevalence: 3.7-3.8
Zhan <i>et al.</i> '01 ^[171]	Observational	US	US	Community dwelling ≥65	100	2001 Zhan criteria	2001 Zhan criteria PIP prevalence: 21.3%

Zhan criteria PIP prevalence: 3.7-31%

McLeod Criteria

Table 2.22. Summary table of studies which have used the McLeod criteria in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Stafford <i>et al.</i> '11 ^[32]	Observational	Australia	Australia	Long term care ≥65	2,345	2003 Beers' criteria 1997 McLeod criteria	Combined criteria PIP prevalence: 43.8% 2003 Beers' criteria PIP prevalence: 35.3% 1997 McLeod criteria PIP prevalence: 18.7%
Pattanworasate <i>et al.</i> '10 ^[65]	Observational	Australia	Australia	Hospital ≥65	202	Modified Australian 2003 Beers' criteria Modified Australian 1997 McLeod criteria Modified 2006 NPS criteria	Combined criteria PIP prevalence: 55% Modified Australian 2003 Beers' criteria PIP prevalence: 44% Modified Australian 1997 McLeod criteria PIP prevalence: 41% Modified 2006 NPS criteria PIP prevalence: 16%
Roughead <i>et al.</i> '07 ^[106]	Observational	Australia	Australia	Community Dwelling ≥70	192,363	Combined criteria (Modified 2003 Beers' ID criteria and modified 1997 McLeod criteria)	Combined criteria PIP prevalence: 21.2%
Klarin <i>et al.</i> '05 ^[133]	Observational	Sweden	Europe	Mixed dataset ≥75	785	Combined criteria (Modified 1997 Beers' criteria and modified 1997 McLeod criteria)	Combined criteria PIP prevalence: 18.6%
Fialova <i>et al.</i> '05 ^[143]	Observational	Europe-Metropolitan areas of the Czech Republic, Denmark, Finland, Iceland, Italy, the Netherlands, Norway, and the United Kingdom.	Europe	Community dwelling ≥65	2,707	Modified 1997 Beers' ID criteria Modified 2003 Beers' ID criteria Modified 1997 McLeod criteria	Overall: Combination of all 3 tools PIP prevalence rate: 19.8 Modified 1997 Beers' ID criteria PIP prevalence: 3.3-17.1% Modified 2003 Beers' ID criteria PIP prevalence: 5.8-25.2% Modified 1997 McLeod criteria PIP prevalence: 3.0-31.8%

McLeod criteria PIP prevalence: 3-41%

NPS; National prescribing service

IPET Criteria

Table 2.23. Summary table of studies which have used the IPET criteria in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Fouquet <i>et al.</i> '12 ^[17]	Observational	France	Europe	Hospital ≥75	150	2003 French modified Beers' criteria 2000 Modified IPET criteria	Combined criteria PIP prevalence: 26.7% 2003 French modified Beers' criteria PIP prevalence: 24.0%. 2000 Modified IPET criteria PIP prevalence: 9.3%.
Luo <i>et al.</i> '11 ^[36]	Observational	Northern Ireland	Europe	Hospital ≥65	192	2003 Beers' criteria 2000 IPET 2006 HEDIS criteria	2003 Beers' criteria PIP prevalence: 25.1-30.7% 2000 IPET PIP prevalence: 19-27.4% 2006 HEDIS PIP prevalence: 5.6-9.7%
Ryan <i>et al.</i> '09 ^[73]	Observational	Ireland	Europe	Community dwelling ≥65	500	2003 Beers' criteria 2000 IPET	2003 Beers' criteria PIP prevalence: 13% 2000 IPET criteria PIP prevalence: 10.4%
Barry <i>et al.</i> '06 ^[118]	Observational	Ireland	Europe	Hospital ≥65	350	2003 Beers criteria 2000 IPET	2003 Beers' PIP prevalence: 34.6% 2000 IPET PIP prevalence: 22%
Gill <i>et al.</i> '01 ^[170]	Intervention	Canada	Canada	Long term care ≥65	355	2000 IPET	2000 IPET PIP prevalence: 18.3%
Naugler <i>et al.</i> '00 ^[173]	Observational	Canada	Canada	Hospital ≥70	361	2000 IPET	2000 IPET PIP prevalence rate:12.5%

IPET PIP prevalence: 9.3-27.4%

MAI; Medication Appropriateness Index

ID; Independent of diagnosis

IPET; The Improved Prescribing in the Elderly Tool

HEDIS; Health Plan Employer Data and Information Set

HEDIS Criteria

Table 2.24. Summary table of studies which have used the HEDIS Criteria in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Pugh <i>et al.</i> '11 ^[21]	Observational	US	US	Community dwelling ≥65	1,567,467	2006 HEDIS criteria (HRME)	2006 HEDIS criteria PIP prevalence: 2004: 13.1% 2005: 12.8% 2006: 12.3%
Pugh <i>et al.</i> '11 ^[35]	Observational	US	US	Community dwelling ≥65	305,041	Modified 2006 HEDIS criteria	Modified 2006 HEDIS criteria PIP prevalence: 15.2%
Luo <i>et al.</i> '11 ^[36]	Observational	Northern Ireland	Europe	Hospital ≥65	192	2003 Beers' criteria 2000 IPET 2006 HEDIS criteria	2003 Beers' criteria PIP prevalence: 25.1-30.7% 2000 IPET PIP prevalence: 19-27.4% 2006 HEDIS PIP prevalence: 5.6-9.7%
Albert <i>et al.</i> '10 ^[46]	Observational	US	US	Community dwelling ≥65	7,459	Modified 2003 Beers' criteria 2006 HEDIS criteria	2003 Beers' criteria PIP prevalence: 53.5% 2006 HEDIS criteria PIP prevalence: 38.8%
Pugh <i>et al.</i> '06 ^[123]	Observational	US	US	Mixed dataset ≥65	1,096,361	2006 HEDIS criteria	2006 HEDIS criteria PIP prevalence: 19.6%

HEDIS PIP prevalence: 5.6-38.8%

MAI; Medication Appropriateness Index

ID; Independent of diagnosis

IPET; The Improved Prescribing in the Elderly Tool

HEDIS; Health Plan Employer Data and Information Set

French list of PIP Criteria

Table 2.25. Summary table of studies which have used the 2001 French list of PIP criteria in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Bongue <i>et al.</i> '09 ^[74]	Observational	France	Europe	Community dwelling ≥65	30,683	Modified 1997 Beers' ID criteria 2001 French list of PIP criteria (Based on the 1997 Beers' ID criteria)	Modified 1997 Beers' ID criteria PIP prevalence rate: 10.1% 2001 French list of PIP criteria prevalence rate : 25.4%
Laroche <i>et al.</i> '06 ^[126]	Observational	France	Europe	Hospital ≥70	2,018	2001 French list of PIP criteria (Based on the 1997 Beers' ID criteria)	2001 French PIP criteria prevalence: 66%
Lechevallier-Michel <i>et al.</i> '05 ^[130]	Observational	France	Europe	Community dwelling ≥65	9,294	2001 French list of PIP criteria (Based on the 1997 Beers' ID criteria)	2001 French PIP criteria prevalence: 38.7%

2001 French list of PIP criteria PIP prevalence: 25.4-66.0%

La Roche Criteria

Table 2.26. Summary table of studies which have used the 2007 La Roche criteria in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Kolzsch <i>et al.</i> '11 ^[22]	Observational	Germany	Europe	Long term care ≥ 65	8,685	Modified German 2007 La Roche criteria	2007 La Roche criteria PIP prevalence: 21.9%
Berdot <i>et al.</i> '09 ^[71]	Observational	France	Europe	Community dwelling ≥ 65	6,343	Combined criteria (Modified 1997 Beers' ID criteria and modified 2003 Beers' ID criteria and La Roche criteria)	Combined criteria PIP prevalence: 31.6%

La Roche criteria PIP prevalence: 21.9-31.6%

Norwegian General Practice (NORGEP) Criteria

Table 2.27. Summary table of studies which have used the Lunn Criteria in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Bakken <i>et al.</i> ' 12 ^[4]	Observational	Norway	Europe	Mixed dataset ≥ 70	400	2009 NORGEPI criteria	2009 NORGEPI criteria PIP prevalence: Overall: 24.1% at admission 34.8% at discharge Nursing Home 25.5% at admission 33.1% at discharge Medical Ward: 22.6% at admission 36.8% at discharge
Nyborg <i>et al.</i> ' 12 ^[6]	Observational	Norway	Europe	Community dwelling ≥ 70	445,900	2009 NORGEPI criteria	2009 NORGEPI criteria PIP prevalence: 34.8%

NORGEPI criteria PIP prevalence: 22.6-36.8%

Assessment of Care of Vulnerable Elders (ACOVE) Criteria

Table 2.28. Summary table of studies which have used the ACOVE criteria in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Shiyanbola <i>et al.</i> '10 ^[47]	Observational	US	US	Community dwelling ≥65	874	2003 Beers' criteria Modified 2001 ACOVE criteria	2003 Beers' criteria PIP prevalence: 26.5% Modified 2001 ACOVE criteria PIP prevalence: 34.7% Combined criteria PIP prevalence: 45.8%
Spinewine <i>et al.</i> '07 ^[94]	Intervention	Belgium	Europe	Hospital ≥70	203	Modified 1997 Beers' ID criteria 1992 MAI Modified 2001 ACOVE criteria	1997 Beers' PIP prevalence: 30% 1992 MAI PIP prevalence: 60% Modified 2001 ACOVE criteria PIP prevalence: 78%

ACOVE PIP prevalence: 34.7-78%

Drug Underutilization Review (DUR) Criteria

Table 2.29. Summary table of studies which have used the Drug Underutilization Review (DUR) criteria in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Fillenbaum <i>et al.</i> '04 ^[150]	Observational	US	US	Community dwelling ≥68	3,165	2002 DUR criteria 1997 Beers' ID criteria	2002 DUR PIP prevalence: 21.3% 1997 Beers' ID criteria PIP prevalence: 27.9%
Hanlon <i>et al.</i> '02 ^[165]	Observational	US	US	Community dwelling ≥65	5,742	2002 DUR criteria	2002 DUR criteria PIP prevalence: 19.2-21.0% 1990: 21.0% 1993: 19.2%

DUR PIP prevalence: 19.2-21.3%

Phadkes' Criteria

Table 2.30. Summary table of studies which have used the Phadkes' Criteria in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Shah <i>et al.</i> '11 ^[43]	Observational	India	Asia	Hospital ≥65	400	2003 Beers' criteria 1998 Phadke's criteria of rationale prescribing	2003 Beers' criteria PIP prevalence: 27.25% 1998 Phadke's criteria of irrational prescribing prevalence: 28.3%

Phadke's irrational prescribing prevalence: 28.3%

Drug Burden Index (DBI)

Table 2.31. Summary table of studies which have used the Drug burden index (DBI) in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Castelino <i>et al.</i> '10 ^[62]	Observational	Australia	Australia	Community dwelling ≥65	372	2003 Beers' criteria 2007 DBI	2003 Beers' criteria prevalence: 39.8% 2007 DBI PIP prevalence: 60.5%

DBI PIP prevalence: 39.8-60.5%

Swedish Quality Indicators

Table 2.32. Summary table of studies which have used the Swedish quality indicators in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Bergman <i>et al.</i> '07 ^[100]	Observational	Sweden	Europe	Long term care ≥ 65	7,904	2008 Swedish quality indicators (incorporating elements of the 1997 Beers' ID criteria)	2008 Swedish quality indicators PIP prevalence: 74%

Swedish quality indicators PIP prevalence: 74%

Rancourt Criteria

Table 2.33. Summary table of studies which have used the Rancourt Criteria in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Rancourt <i>et al.</i> 04 ^[156]	Observational	Canada	Canada	Long term care ≥ 65	2,633	2004 Rancourt et al. consensus criteria (largely based on the Beers' and the McLeod criteria)	2004 Rancourt consensus criteria PIP prevalence: 54.7%

Rancourt criteria PIP prevalence: 54.7%

Lunn Criteria

Table 2.34. Summary table of studies which have used the Lunn Criteria in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Lunn <i>et al.</i> '97 ^[176]	Observational	UK	Europe	Long term care ≥60	101	1997 Lunn consensus PIP criteria	1997 Lunn consensus criteria PIP prevalence: 53%

Lunn criteria PIP prevalence: 53%

National Prescribing Service (NPS) Indicators of Quality Prescribing

Table 2.35. Summary table of studies which have used NPS indicators of quality prescribing in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Pattanworasate <i>et al.</i> '10 ^[181]	Observational	Australia	Australia	Hospital ≥65	202	Modified Australian 2003 Beers' criteria Modified Australian 1997 McLeod criteria Modified 2006 NPS criteria	Combined criteria PIP prevalence: 55% Modified Australian 2003 Beers' criteria PIP prevalence: 44% Modified Australian 1997 McLeod criteria PIP prevalence: 41% Modified 2006 NPS criteria PIP prevalence: 16%

NPS PIP prevalence: 16%

PRISCUS Criteria

Table 2.36. Summary table of studies which have used the Lunn Criteria in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Amann <i>et al.</i> '12 ^[16]	Observational	Germany	Europe	Community dwelling ≥65	804,400	2010 PRISCUS List	2010 PRISCUS List PIP prevalence: 25.0-28.3%

PRISCUS criteria PIP prevalence: 25-28.3%

Australian Criteria

Table 2.37. Summary table of studies which have used the 2008 Australian Criteria in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Garcia-Gollarte <i>et al.</i> ' 12 ^[9]	Observational	Spain	Europe	Long term care ≥65	100	2008 STOPP criteria 2008 START criteria 2006 Australian criteria	2008 STOPP PIP prevalence: 79.0%. 2006 Australian PIP prevalence: 95.0%. 2008 START PPO prevalence: 74.0%..

Australian criteria PIP prevalence: 95.0%

Screening Tool to Alert doctors to Right Treatment (START) Criteria

Table 2.38. Summary table of studies which have used the START Criteria in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Garcia-Gollarte <i>et al.</i> '12 ^[9]	Observational	Spain	Europe	Long term care ≥65	100	2008 STOPP criteria 2008 START criteria 2006 Australian criteria	2008 STOPP PIP prevalence: 79.0%. 2006 Australian PIP prevalence: 95.0%. 2008 START PPO prevalence: 74.0%..
Ubeda <i>et al.</i> '12 ^[10]	Observational	Spain	Europe	Long term care ≥65	81	2008 STOPP criteria 2008 START criteria 2003 Beers criteria	Combined criteria PIP prevalence: 64.0% 2008 STOPP PIP prevalence: 48.0%. 2003 Beers' criteria PIP prevalence: 25.0%. 2008 START PPO prevalence: 44.0%..
Ryan <i>et al.</i> '12 ^[11]	Observational	Ireland	Europe	Long term care ≥65	313	2008 STOPP criteria 2008 START criteria	2008 STOPP PIP prevalence: 59.8%. 2008 START PPO prevalence: 42.2%..
Dalleur <i>et al.</i> '12 ^[12]	Observational	Belgium	Europe	Hospital ≥75	302	2008 STOPP criteria 2008 START criteria	2008 STOPP PIP prevalence: 48.0%. 2008 START PPO prevalence: 63.0%..
Borges <i>et al.</i> '11 ^[19]	Observational	Portugal	Europe	Hospital ≥65	105	2008 START criteria	2008 START criteria PPO prevalence: 41.9%.
Gallagher <i>et al.</i> '11 ^[34]	Observational	Europe	Europe	Hospital ≥65	900	2008 STOPP criteria 2008 START criteria 2003 Beers' criteria	Overall 2008 STOPP criteria PIP prevalence: 51.3%. Ranging from 34.7- 77.3% Overall 2003 Beers' criteria PIP prevalence: 30.4%. Ranging from 22.7-43.3%. Overall 2008 START criteria PPO prevalence: 59.4%. Ranging from 51.3- 72.7%.
Liu <i>et al.</i> '11 ^[37]	Observational	Taiwan	Asia	Hospital ≥65	520	2008 STOPP criteria 2008 START criteria	2008 STOPP criteria PIP prevalence: 36.2% 2008 START criteria PPO prevalence: 41.9%.
Gallagher <i>et al.</i> '11 ^[38]	Intervention	Ireland	Europe	Hospital ≥65	400	2008 STOPP criteria 2008 START criteria 1992 MAI 1999 AOU criteria	2008 combined STOPP and START criteria combined prevalence: 58.4% 1992 MAI prevalence: 48% 1999 AOU criteria prevalence: 37%
Lang <i>et al.</i> '11 ^[39]	Intervention	Switzerland	Europe	Hospital ≥65	134	2008 STOPP criteria (French	2008 STOPP criteria PIP prevalence:

						adaption) 2008 START criteria (French adaption)	Admission: 77.3% Discharge: 18.6% 2008 START criteria PPO prevalence: Admission: 64.7% Discharge: 11.2%
Conejos Miquel <i>et al.</i> '10 ^[57]	Observational	Spain	Europe	Mixed dataset ≥65	150	2003 Beers' criteria 2008 STOPP criteria 2008 START criteria	Primary Care 2003 Beers' criteria PIP rate: 24% 2008 STOPP criteria PIP rate: 36% 2008 START criteria PIP rate: 28% Secondary Care 2003 Beers' criteria PIP prevalence: 26% 2008 STOPP criteria PIP prevalence: 54% 2008 START criteria PIP prevalence: 54% Nursing Home Care 2003 Beers' criteria PIP prevalence: 20% 2008 STOPP criteria PIP prevalence: 50% 2008 START criteria PIP prevalence: 46%
Pyszka <i>et al.</i> '10 ^[60]	Observational	US	US	Hospital ≥70	111	Modified 2008 STOPP criteria 2008 START criteria	Modified 2008 STOPP criteria PIP prevalence: 65% at admission 64% at discharge 64% at follow-up 2008 START criteria PPO prevalence: 52% at admission 40% at discharge 35% at follow-up
Lang <i>et al.</i> '10 ^[63]	Observational	Switzerland	Europe	Hospital ≥65	150	2008 STOPP criteria (French adaption) 2008 START criteria (French adaption)	2008 STOPP criteria PIP prevalence: 77% START PPO RATE: 65%.
Ryan <i>et al.</i> '09 ^[73]	Observational	Ireland	Europe	Community dwelling ≥65	1,329	2003 Beers' criteria 2008 STOPP criteria 2008 START criteria	2003 Beers' criteria PIP prevalence: 18.3% 2008 STOPP criteria PIP prevalence: 21.4% 2008 START criteria PPO prevalence: 22.7%
Barry <i>et al.</i> '07 ^[95]	Observational	Ireland	Europe	Hospital ≥65	600	2008 START criteria	2008 START criteria PPO prevalence: 57.8%

START PPO prevalence: 11.2- 74.0%.

Assessment of Underutilisation (AOU) Criteria

Table 2.39. Summary table of studies which have used the assessment of underutilisation (AOU) criteria in older individuals

Study	Study type	Country	Jurisdiction	Care setting /age category	No of patients	Criteria	PIP Prevalence
Gallagher <i>et al.</i> '11 ^[38]	Intervention	Ireland	Europe	Hospital ≥65	400	2008 STOPP criteria 2008 START criteria 1992 MAI 1999 AOU criteria	Combined 2008 STOPP and START criteria combined prevalence: 58.4% 1992 MAI prevalence: 48% 1999 AOU criteria prevalence: 37%
Wright <i>et al.</i> '09 ^[67]	Observational	US	US	Hospital ≥65	384	1999 AOU criteria	1999 AOU criteria PPO prevalence: 62%
Steinman <i>et al.</i> '06 [122]	Observational	US	US	Community dwelling ≥65	196	2003 Beers' criteria 1999 AOU criteria Modified 1992 MAI criteria (unnecessary drug use)	Modified 1992 MAI PIP prevalence: 57% 2003 Beers' criteria PIP prevalence: 37% 1999 AOU criteria PPO prevalence: 64%

AOU PPO prevalence: 37-64%

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