The Prevalence and Incidence of Dementia: a Systematic Review and Meta-analysis

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ABSTRACT: Introduction: Dementia is a common neurological condition affecting many older individuals that leads to a loss of independence, diminished quality of life, premature mortality, caregiver burden and high levels of healthcare utilization and cost. This is an updated systematic review and meta-analysis of the worldwide prevalence and incidence of dementia. Methods: The MEDLINE and EMBASE databases were searched for relevant studies published between 2000 (1985 for Canadian papers) and July of 2012. Papers selected for full-text review were included in the systematic review if they provided an original population-based estimate for the incidence and/or prevalence of dementia. The reference lists of included articles were also searched for additional studies. Two individuals independently performed abstract and full-text review, data extraction, and quality assessment of the papers. Random-effects models and/or meta-regression were used to generate pooled estimates by age, sex, setting (i.e., community, institution, both), diagnostic criteria utilized, location (i.e., continent) and year of data collection. Results: Of 16,066 abstracts screened, 707 articles were selected for full-text review. A total of 160 studies met the inclusion criteria. Among individuals 60 and over residing in the community, the pooled point and annual period prevalence estimates of dementia were 48.62 (CI95%: 41.98-56.32) and 69.07 (CI95%: 52.36-91.11) per 1000 persons, respectively. The respective pooled incidence rate (same age and setting) was 17.18 (CI95%: 13.90-21.23) per 1000 person-years, while the annual incidence proportion was 52.85 (CI95%: 33.08-84.42) per 1,000 persons. Increasing participant age was associated with a higher dementia prevalence and incidence. Annual period prevalence was higher in North America than in South America, Europe and Asia (in order of decreasing period prevalence) and higher in institutional compared to community and combined settings. Sex, diagnostic criteria (except for incidence proportion) and year of data collection were not associated with statistically significant different estimates of prevalence or incidence, though estimates were consistently higher for females than males. Conclusions: Dementia is a common neurological condition in older individuals. Significant gaps in knowledge about its epidemiology were identified, particularly with regard to the incidence of dementia in low- and middle-income countries. Accurate estimates of prevalence and incidence of dementia are needed to plan for the health and social services that will be required to deal with an aging population.

RÉSUMÉ: Prévalence et incidence de la démence : revue systématique et méta-analyse. Contexte: La démence est une maladie neurologique fréquente touchant de nombreuses personnes âgées. Elle est la cause de la perte de l’indépendance, d’une qualité de vie altérée, d’une mortalité prématurée et constitue un fardeau important pour les soignants. Elle entraîne une utilisation et un coût élevé de soins de santé par ces patients. Nous avons effectué une revue systématique et une méta-analyse à jour de la prévalence et de l’incidence de la démence à travers le monde. Méthodologie: Nous avons identifié les études pertinentes publiées entre 2000 (1985 pour les publications canadiennes) et juillet 2012 dans les bases de données MEDLINE et EMBASE. Les articles choisis pour un examen du texte intégral ont été inclus dans l’examen systématique s’ils fournissaient une estimation originale à l’échelle populationnelle de l’incidence et/ou de la prévalence de la démence. Nous avons également recherché des études additionnelles dans la liste de références incluse dans ces articles. Deux évaluateurs ont reçu indépendamment les résumés et le texte intégral des publications ainsi que l’extraction des données et ils en ont évalué la qualité. Nous avons utilisé des modèles à effets aléatoires et/ou de méta-régression pour générer des estimations regroupées par âge, sexe, milieu (communauté, institution ou les deux), critères diagnostiques utilisés, lieu (continent), et année de collecte des données. Résultats: Parmi les 16 066 résumés revus, 707 articles ont été choisis pour un texte du revue intégral. En tout, 160 articles rencontraient les critères d’inclusion. Chez les individus de 60 ans et plus demeurant dans la communauté, les estimés regroupés de prévalence ponctuelle et annuelle de démence étais de 48,62...
prévalence et de l’incidence de la démence est une maladie neurologique fréquente chez les individus plus âgés. Nous avons identifié des périodes données était plus élevée en Amérique du Nord qu’en Amérique du Sud, en Europe ou en Asie (en ordre décroissant de prévalence par période) et plus élevée dans un contexte institutionnel par rapport à la communauté et aux deux contextes combinés. Le sexe, les critères diagnostiques (sauf pour la proportion d’incidence) et l’année de la collecte des données n’étaient pas associés à des estimations de prévalence ou d’incidence significativement différentes au point de vue statistique, bien que les estimations étaient constamment plus élevées chez les femmes que chez les hommes. Conclusions: La démence est une maladie neurologique fréquente chez les individus plus âgés. Nous avons identifié d’importantes lacunes dans les connaissances sur l’épidémiologie, particulièrement en ce qui concerne l’incidence de la démence dans les pays à revenu faible et intermédiaire. Des estimations exactes de la prévalence et de l’incidence de la démence sont nécessaires pour la planification des services de santé et des services sociaux qui seront requis par une population vieillissante.

Keywords: démence, meta-analysis, systematic review

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INTRODUCTION

Dementia as defined in the Diagnostic and Statistical Manual of Mental Disorders–IV–Text Revision (DSM–IV–TR) is an acquired condition marked by impairments in memory and at least one other cognitive domain that are severe enough to cause significant limitations in social and/or occupational functioning and are not accounted for by a delirium or another Axis I disorder.1 The DSM–5 renames dementia as major neurocognitive disorder.2 For diagnosis there must be evidence of significant decline in at least one cognitive domain that is severe enough to interfere with independence in everyday activities.2 Compared to earlier versions of the DSM, memory loss and impairments in multiple cognitive domains are no longer required features.2 The various causes of dementia are categorized by their neuropathology, clinical features and/or presumed aetiology. The commoner ones encountered in middle-aged and older individuals are Alzheimer’s disease, vascular, Lewy body and frontotemporal dementia. They occur either as the sole cause of dementia (i.e., “pure” disease) or as combinations of two or more brain pathologies.

In addition to its significant personal toll, dementia is a major contributor to healthcare costs.3 A 2013 report estimated that the annual cost of dementia in the United States was $157–215 billion US.4 The total economic burden of dementia in Canada in 2008 was estimated to be $15 billion dollars.5 The World Health Organization recognized dementia as a public health priority in 2012.6 Age is the most important risk factor for dementia, with prevalence doubling every 5 years after 65 (from approximately 2-3% in those 65-69 to 30%+ among individuals over 80).7-12 It might also be more common among women, though the literature is inconsistent on this point.13,14 High prevalence estimates are found in long-term care institutions,14 with the majority of those in these settings with moderate to severe dementia.15 With societal aging, the burden of this condition will increase over the coming years. It is anticipated that the number suffering from dementia worldwide will double by 2030 and triple by 2050.6

Whether the incidence and/or prevalence of dementia are changing over time is a key question about the epidemiology of this condition. Recent studies suggest that the age-adjusted incidence and/or prevalence of dementia in older populations could be changing over time but not in a consistent pattern, with estimates decreasing in high-income countries but increasing in middle-income ones. As an example of the former, investigators using data from the Rotterdam Study reported a nonsignificant decline in age-adjusted incidence rates between 1990 and 2010 among those 65+ (incidence rate ratio 0.75, CI95%: 0.56-1.02), possibly on the basis of better control of vascular risk factors. In parallel with an increase in the use of antithrombotics and lipid-lowering drugs over time, brain MRIs showed fewer lacunar infarcts.16 It is plausible that improved cardiovascular risk management would be associated with a decreased incidence but stable prevalence (or a prevalence that is decreasing less markedly than incidence) of dementia as populations affected by dementia would live longer. Matthews et al.17 of the UK Medical Research Council Cognitive Function and Ageing Study (CFAS) found that the age- and sex-standardized prevalence of dementia among those 65+ years of age in three geographically defined areas of England was 65 per 1000 in 2011. This was significantly lower than the predicted rate based on 1991 data of 83 per 1000. There was a lower response rate in the 2011 study, but sensitivity analyses suggest that the estimates were robust to this. On the other hand, a systematic review of reports on the epidemiology of dementia in China found that the prevalence rose from 18 per 1,000 (65-69 years of age) and 421 per 1000 (95-99 years) to 26 per 1000 and 605 per 1000 respectively, between 1990 and 2010.18 With societal aging worldwide, the number of individuals with dementia will increase, but there is uncertainty about what the actual number will be.19 Aside from the importance of having accurate up-to-date figures for planning services to deal with the needs of those suffering from dementia, a better understanding of whether incidence and/or prevalence is changing would have important scientific and clinical consequences. For one thing, a decline would suggest that future rates are partially modifiable and that effectively dealing with modifiable risk factors might delay the onset if not entirely prevent the development of dementia as we age.

The specific objectives of this report are to: (1) provide estimates of the overall worldwide prevalence and incidence of dementia; (2) examine factors that underlie the heterogeneity of estimates (age, sex, setting [i.e., community, institution, both], diagnostic criteria, location of study [i.e., continent]); and (3) search for evidence of change over time in the prevalence and/or incidence of dementia. This study updates and extends the scope of previous reports on the epidemiology of this condition.9-14

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Methods

This is one in a series of systematic reviews on the prevalence and incidence of priority neurological conditions funded by the Public Health Agency of Canada as part of the National Population Health Study of Neurological Conditions.20

Search Strategy

The systematic review and meta-analysis were conducted according to a predetermined protocol based on the PRISMA statement for systematic reviews and meta-analyses.21 Study authors with expertise in dementia and disease epidemiology and a research librarian with systematic review expertise developed the search strategy and terms (see Appendix A). The MEDLINE and EMBASE databases were searched from January 1985 to February 2011, with references exported and managed using EndNote X5.22 The search was updated in July of 2012. Due to the availability of prior systematic reviews covering earlier time periods, only international studies published after 1999 were included in our systematic review. Because of the national focus of this project, Canadian studies published between 1985 and 1999 were also included in order to ensure that the Canadian Study of Health and Aging (a large and impactful national study on the epidemiology of dementia) was captured.9 Articles had to be published in either English or French. The reference lists of included articles were manually searched for additional relevant references.

Study Selection

Two reviewers independently screened the titles and abstracts of all identified references to determine if they appeared to report original data on the prevalence or incidence of dementia. Studies clearly not population-based were excluded at this stage. Two reviewers independently examined the full-text articles identified in the first phase. For inclusion in the systematic review, articles had to meet the following criteria: (1) original research; (2) population-based; and (3) reported an incidence and/or prevalence estimate of dementia. Reviewers fluent in the language of the article examined the paper. Disagreements pertaining to the inclusion of articles were resolved by consensus and, if not reached, by involvement of a third study author.

Data Extraction and Study Quality

Two reviewers independently extracted and reached agreement on data from included articles using a standard data collection form. When multiple articles reported data from the same study population, the reviewers made a judgment as to the most comprehensive and accurate data available, which was then used in analyses. In cases where the studies reported on different timeframes or subgroups (e.g., by sex or age), all data were included. Demographic data recorded included age, sex, study setting (i.e., community, institution, both), and geographic location of study (i.e., continent, country). As not all studies reported on the mean or median age of participants, the youngest age of participants included in a study was employed in our analyses of age. The definitions/diagnostic criteria used for determining the presence of dementia were noted. Incidence and prevalence estimates of dementia from each study were recorded, along with any stratification by age, sex or year of data collection. The quality of the included studies was evaluated using an assessment tool23,24 (Appendix B) that assessed such factors as sample representativeness, methods used to determine the presence of dementia, and statistical methods. Each study was given a quality score that ranged from 0 (lowest) to 8 (highest). ANOVA testing was done to determine if study quality varied by location of study (i.e., continent).

Data Synthesis and Analysis

The significance of the impact of age, sex, setting, diagnostic criteria, continent and year of data collection (i.e., when the study was done) on incidence and prevalence estimates was assessed using meta-regression. Age was examined using the youngest age of participants in the study as a continuous variable. Sex, setting, diagnostic criteria and location (i.e., continent) were examined as categorical variables. Changes over time were examined in three separate sensitivity analyses using study start, midpoint and end-years of data collection. All pooled estimates provided are restricted to studies reporting on people aged 60+, 65+ or 70+ to mitigate the potential confounding effects of age. Estimates were also stratified by study setting to limit potential confounding by disease severity. Finally, all estimates reporting on a period (e.g., period prevalence) were converted to annual estimates (e.g., annual prevalence) without restricting time-years.

To be eligible for inclusion in the meta-analysis, studies had to provide either the estimate with 95% confidence intervals (CI95%), or the number of dementia cases along with the sample size, so the prevalence or incidence estimates could be calculated. Additionally, a subgroup was only included in the subgroup analysis if more than one study was available for that subgroup.

To assess for significant between-study heterogeneity, the Cochrane Q statistic was calculated and I² was used to quantify the magnitude of between-study heterogeneity. All the pooled estimates and 95% confidence intervals were calculated using a random-effects model. Publication bias was investigated visually using funnel plots and statistically using Beggs’s25 and Egger’s26 tests.

All statistical analyses were carried out with R version 2.14.27 The meta package was employed to produce the pooled estimates, forest plots and publication bias assessment.28 The metafor package was used to conduct the meta-regression using restricted maximum likelihood estimation.29 A p value <0.05 was deemed to be statistically significant.

RESULTS

Identification and Description of Studies

The search strategy yielded a total of 16,066 citations, including duplicates (8,743 from MEDLINE and 7,323 from EMBASE). A total of 707 articles were selected for full-text review (Figure 1), of which 547 were excluded (i.e., 230 were international studies published before 2000, 164 did not report an incidence or prevalence of dementia, 114 were not population-based, while 39 provided no original data). An additional four articles were identified by the updated search, while manual reference searching of included papers led to an additional 12 articles, though these papers did not report estimates of overall dementia, but rather only reported on dementia subtypes. Thus, a total of 160 studies were retained, the characteristics of which are shown in Tables 1–3. Twenty studies were not eligible for meta-analysis because they reported duplicate data or did not provide the information necessary to calculate an estimate. A total

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of 67 studies met the eligibility criteria (described earlier) for inclusion in the meta-analysis of those aged 60+, 65+ or 70+ years. Of the 160 total studies, 111 reported on prevalence, 9, 11, 14, 30–137 44 on incidence, 8, 10, 138–179 and 5 on both. 7, 180–183 Sixty-three originated from Europe, 45 Asia, 43 North America, 7 South America, 5 Australia and 4 Africa (seven studies reported on data from more than one continent).

Prevalence of Dementia

Sixty-six articles reported on the point prevalence of dementia, 7, 9, 32, 33, 36, 40–45, 47, 50–52, 54–57, 64, 67–69, 71, 73, 75, 77–80, 82, 83, 88–90, 97, 98, 101–103, 105–109, 112–115, 117, 120, 121, 123–125, 127–131, 133, 135, 137, 181 29 eligible for inclusion (i.e., provided an estimate with 95% confidence intervals, etc.) in the meta-analysis of those including populations aged 60+, 65+ or 70+ years. 9, 32, 33, 38, 41–43, 50–52, 54, 67, 71, 73, 75, 77, 82, 89, 90, 98, 113, 120, 123–125, 129, 131, 135, 181

In all studies reporting on the point prevalence of dementia (n = 66), the majority of studies used a single data source to identify cases (n = 51). These included door-to-door surveys (n = 16), registry studies (n = 10), other sources (n = 10), administrative databases (n = 3), mail surveys (n = 1) and hospital/clinic reviews (n = 1). It was not possible to determine the data source in 10 of these studies. A total of 15 studies used multiple data sources. Half (n = 33) of the 66 included studies used a single diagnostic method, including a standardized assessment by a healthcare
| Author, Date          | Country and Region | Age Range Studied | Data Source                  | Diagnosis Established by | Diagnostic Criteria                      | Years of Data Collection | Groups Studied             |
|----------------------|--------------------|-------------------|------------------------------|--------------------------|------------------------------------------|---------------------------|---------------------------|
| Anttila (2002)       | FINLAND            | 100+              | Other                        | Health professional      | NINCDS-ADRDA; NINDS-AIREN                | 1998                      | Overall                   |
|                      |                    |                   |                              |                          |                                          |                           | Male Overall              |
|                      |                    |                   |                              |                          |                                          |                           | Female Overall            |
| Anttila (2004)       | FINLAND            | 70+               | Cannot determine             | Health professional      | DSM-IV                                   | 1998                      | Overall                   |
|                      | Kupio and Joensuu  |                   |                              |                          |                                          |                           | Male Overall              |
|                      |                    |                   |                              |                          |                                          |                           | Female Overall            |
| Banerjee (2008)      | INDIA              | 50+               | Door-to-Door survey          | Health professional      | DSM-IV                                   | 2002-2003                 | Overall                   |
|                      | Kolkata            |                   |                              |                          |                                          |                           | Male 51-60                |
|                      |                    |                   |                              |                          |                                          |                           | Male 61-64                |
|                      |                    |                   |                              |                          |                                          |                           | Male 65-70                |
|                      |                    |                   |                              |                          |                                          |                           | Male 71-80                |
|                      |                    |                   |                              |                          |                                          |                           | Male 81+                  |
|                      |                    |                   |                              |                          |                                          |                           | Male Overall              |
|                      |                    |                   |                              |                          |                                          |                           | Female 51-60              |
|                      |                    |                   |                              |                          |                                          |                           | Female 61-64              |
|                      |                    |                   |                              |                          |                                          |                           | Female 65-70              |
|                      |                    |                   |                              |                          |                                          |                           | Female 71-80              |
|                      |                    |                   |                              |                          |                                          |                           | Female 81+                |
|                      |                    |                   |                              |                          |                                          |                           | Female Overall            |
|                      |                    |                   |                              |                          |                                          |                           | 51-60                     |
|                      |                    |                   |                              |                          |                                          |                           | 61-64                     |
|                      |                    |                   |                              |                          |                                          |                           | 65-70                     |
|                      |                    |                   |                              |                          |                                          |                           | 71-80                     |
|                      |                    |                   |                              |                          |                                          |                           | 81+                       |
|                      |                    |                   |                              |                          |                                          |                           | 60+                       |
| Bennett (2003)       | AUSTRALIA          | 75+               | Door-to-Door survey          | Health professional      | McKeith                                  | 1997-1999                 | Overall                   |
| Bermejo-Pareja (2008)| SPAIN              | 65+               | Door-to-Door survey          | Health professional      | DSM-IV                                   | 1997-1998                 | Male 65-69                |
|                      | Las Margaritas, Lista, Arevalo | | Mailed survey | Administrative data codes |                           |                           |                           | Male 70-74                |
|                      |                    |                   |                              | Medical chart review     |                                          |                           | Male 75-79                |
|                      |                    |                   |                              |                          |                                          |                           | Male 80-84                |
|                      |                    |                   |                              |                          |                                          |                           | Male 85-90                |
|                      |                    |                   |                              |                          |                                          |                           | Male 90+                  |
|                      |                    |                   |                              |                          |                                          |                           | Male Overall              |
|                      |                    |                   |                              |                          |                                          |                           | Female 65-69              |
|                      |                    |                   |                              |                          |                                          |                           | Female 70-74              |
|                      |                    |                   |                              |                          |                                          |                           | Female 75-79              |
|                      |                    |                   |                              |                          |                                          |                           | Female 80-84              |
|                      |                    |                   |                              |                          |                                          |                           | Female 85-90              |
|                      |                    |                   |                              |                          |                                          |                           | Female 90+                |
|                      |                    |                   |                              |                          |                                          |                           | Female Overall            |
|                      |                    |                   |                              |                          |                                          |                           | 65-69                     |
|                      |                    |                   |                              |                          |                                          |                           | 70-74                     |
|                      |                    |                   |                              |                          |                                          |                           | 75-79                     |
|                      |                    |                   |                              |                          |                                          |                           | 80-84                     |
|                      |                    |                   |                              |                          |                                          |                           | 85-90                     |
|                      |                    |                   |                              |                          |                                          |                           | 90+                       |
|                      |                    |                   |                              |                          |                                          |                           | Overall                   |
Table 1. (Continued)

| Author, Date | Country and Region | Age Range Studied | Data Source | Diagnosis Established by | Diagnostic Criteria | Years of Data Collection | Groups Studied |
|--------------|-------------------|-------------------|-------------|--------------------------|---------------------|--------------------------|----------------|
| Borjesson-Hanson (2004) | SWEDEN Goteborg | 95+ | Census | Health professional Medical chart review | DSM-III-R | 1996-1998 | Male Overall Female Overall Overall |
| Bottino (2008) | BRAZIL Sao Paulo | 60+ | Door-to-Door survey | Health professional Imaging test | DSM-IV | 2000 | Overall 60-64 65-69 70-74 75-79 80-84 85-89 90+ Female Overall Male Overall |
| Canadian Study of Health and Aging Working Group (1994) | CANADA | 65+ | Administrative Databases | Health professional | DSM-III-R | 1991-1992 | Male 85+ Female 85+ Overall Male 65-74 Male 75-84 Male 85+ Male Overall Female 65-74 Female 75-84 Female 85+ Female Overall 65-74 75-84 85+ |
| Cristina (2001) | ITALY Belgioioso, Casorate Primo, Cava Manara, S. Martino Siccomario | 65+ | Door-to-Door survey | Health professional | DSM-III-R | 1992-1993 | Male 65-69 Male 70-74 Male 75-79 Male 80-84 Male 85+ Male Overall Female 65-69 Female 70-74 Female 75-79 Female 80-84 Female 85+ Female Overall 65-69 70-74 75-79 80-84 85+ Overall |
| Dahl (2007) | SWEDEN | 65+ | Registry | Health Professional; Administrative Data Codes | DSM-IV | 2005 | Overall |
| Study (Year)      | Country | Age Group | Survey Method | Professional | Diagnostic Tool     | Study Period | Results |
|------------------|---------|-----------|---------------|--------------|---------------------|--------------|---------|
| Das (2006)       | India   | 50+       | Door-to-Door survey | Health professional | DSM-IV              | 2003-2004    | Overall Male Overall Female Overall Male 50-59 Male 60-69 Male 70-79 Male 80+ Female 50-59 Female 60-69 Female 70-79 Female 80+ |
| Das (2008)       | India   | 60+       | Door-to-Door survey | Health professional | DSM-IV              | 2003-2004    | Overall Female Overall Male Overall 60-69 Female 60-69 Male 60-69 70-79 Female 70-79 Male 70-79 80+ Female 80+ Male 80+ |
| de Jesus Llibre (2009) | Cuba   | 75+       | Door-to-Door survey Registry | Health professional Imaging test Other | DSM-IV              | 2003         | Overall Male Overall Female Overall |
| de Ronchi (2005) | Italy   | 60+       | Door-to-Door survey | Health professional | DSM-III-R          | 1991         | Overall Male Overall Female Overall |
| de Silva (2003)  | Sri Lanka | 65+     | Registry      | Health professional | DSM-IV              | 2000         | Overall Male Overall Female Overall Male 65-75 Male 76-85 Male 85+ Male Overall Female 65-75 Female 76-85 Female 85+ Female Overall 65-75 76-85 85+ |
| Demirovic (2003) | USA     | 65+       | Door-to-Door survey Census | Health professional Imaging test | NINCDS-ADRDA      | 1993-1996    | Male Overall Female Overall |
| Fish (2008)      | Wales   | 65+       | Registry      | Health professional Medical chart review Imaging test Other | NINCDS-ADRDA; NINDS-AIREN | 2003         | Overall 65-69 70-74 75-79 80-84 |
| Fujishima (2002) | Japan   | 65+       | Registry      | Health professional | DSM-III; DSM-III-R | 1985 1992    | Overall Male Overall Female Overall 65-69 70-74 |
| Galasko (2007)   | Guam    | 65+       | Door-to-door survey Registry | Health professional | DSM-IV              | 2003-2005    | Overall Male Overall Female Overall 65-69 70-74 |
| Author, Date  | Country and Region | Age Range Studied | Data Source | Diagnosis Established by | Diagnostic Criteria | Years of Data Collection | Groups Studied |
|--------------|--------------------|-------------------|-------------|--------------------------|---------------------|--------------------------|----------------|
| Community Only |                    |                   |             |                          |                     |                          |                |
| Ganguli (2000) | India HaryanaBallabgarh USA | 55+ | Door-to-Door survey Registry | Health professional Medical chart review | DSM-III-R | 1995-1997 1987-1989 | Overall |
| Gourie-Devi (2004) | INDIA | 0+ | Door-to-Door survey | Health professional | None | 1993-1995 | Overall |
| Guerchet (2010) | CONGO | 70+ | Door-to-Door survey | Health professional Medical chart review | DSM-IV | 2008-2009 | 65-74 75-84 85+ Male 65-74 Male 75-84 Male 85+ Female 65-74 Female 75-84 Female 85+ |
| Gureje (2006) | NIGERIA | 65+ | Door-to-Door survey | Health professional | DSM-IV | 2003-2004 | Overall Male Overall Female Overall 65-69 70-74 75-79 80+ |
| Gurvit (2008) | TURKEY Instabul Kad-koy | 70+ | Door-to-Door survey | Health professional | DSM-III | N/A | Overall Male Overall Female Overall 70-74 75-79 80+ Male 70-74 Male 75-79 Male 80+ Female 70-74 Female 75-79 Female 80+ |
| Study            | Country | Age Group | Methodology          | Diagnosis Tool | Year    | Age Range | Male Overall | Female Overall | Overall |
|------------------|---------|-----------|----------------------|----------------|---------|-----------|--------------|---------------|---------|
| Hall (2009)      | USA     | 65+ 70+   | Door-to-Door survey  | Health professional | 1992    | 70-74     | 75-79        | 80-85         | 85+     |
| Herrera (2002)   | BRAZIL  | 70+       | Door-to-Door survey  | Health professional | N/A     | Male      | Female       | Overall       | Overall |
| Ikeda (2001)     | JAPAN   | 65+       | Door-to-Door survey  | Health professional | 1997    | Overall   |              |               |         |
| Ikeda (2004)     | JAPAN   | 65+       | Door-to-Door survey  | Health professional | 1997-1998 | Overall   |              |               |         |
| Jacob (2007)     | INDIA   | 65+       | Doorto-Door survey   | Other           | DSM-IV  | N/A       | Overall      |               |         |
| Jhoo (2008)      | KOREA   | 65+       | Mailed survey        | Health professional | 2005-2006 | 65-69     | 70-74        | 80+           | Male Overall |
| Jitapunkul (2001)| THAILAND| 60+       | Door-to-Door survey  | Other           | None    | 1997      | Overall      |               |         |
| Jitapunkul (2009)| THAILAND| 50+       | Door-to-Door survey  | Health professional | 1999    | Overall   |              |               |         |
| Kim (2003)       | KOREA   | 65+       | Door-to-Door survey  | Health professional | 2001-2002| 65-69     | 70-74        | 80+           | Male Overall |
| Author, Date | Country and Region | Age Range Studied | Data Source | Diagnosis Established by | Diagnostic Criteria | Years of Data Collection | Groups Studied |
|--------------|-------------------|------------------|-------------|--------------------------|---------------------|-------------------------|---------------|
| Kivipelto (2001) | FINLAND Kupio and Joensuu | 70+ | Cannot determine | Health professional | DSM-IV | 1998 | Overall |
| Kivipelto (2002) | FINLAND Kupio and Joensuu | 70+ | Cannot determine | Health professional | DSM-IV | 1998 | Overall |
| Landi (2005) | ITALY | 80+ | Registry | Health professional | None | 2003-2004 | Overall Male Overall Female Overall |
| Langa (2005) | USA | 70+ | Cannot determine | Health professional | DSM-III-R | 2000-2002 | Overall |
| Lee (2002) | KOREA Seoul Kwanak District | 65+ | Door-to-Door survey | Health professional Medical chart review Imaging test | DSM-IV | 1999-2000 | 65-69 70-74 75-79 80-84 85+ Overall |
| Li (2007) | CHINA Beijing | 60+ | Door-to-Door survey | Health professional | DSM-IV | 1997 1999 | Male Overall Female Overall Overall 60-69 70-79 80+ |
| Llibre Rodriguez (2008) | CUBA | 65+ | Administrative database Door-to-Door survey | Other | DSM-IV | N/A | Overall 65-69 70-74 75-79 80+ |
| Llibre-Rodriguez (2008) | CHINA CUBA DOMINICAN REPUBLIC INDIA MEXICO PERU VENEZUELA | 65+ | Door-to-Door survey | Health professional | DSM-IV | N/A | Male 65-69 Male 70-74 Male 75-79 Male 80+ Female 65-69 Female 70-74 Female 75-79 Female 80+ Overall |
| Maneno (2006) | USA | 60+ | Administrative databases | Health professional Administrative database | ICD-9 | 2000-2002 | Overall |
| Mathuranath (2010) | INDIA Kerala | 55+ | Door-to-Door survey | Health professional | DSM-IV | 2004 | 55-59 60-64 65-69 70-74 75-79 80-84 85+ 55+ 65+ Male 55-59 |
| Study (Year) | Location | Age Group | Data Collection Method | Diagnostic Criteria | Year | Gender(s) |
|-------------|----------|-----------|------------------------|---------------------|------|-----------|
| Meguro (2002) | JAPAN Tajiri | 65+ | Other | Health professional Imaging | DSM-IV | 1998 | Overall Male 65+ Female 65+ |
| Mehlig (2008) | SWEDEN | 38+ | Registry | Health professional Medical chart review | DSM-III-R | 1968-2002 | Female |
| Molero (2007) | CARRIBBEAN Venezuela Maracaibo | 55+ | Door-to-Door survey | Health professional Imaging | NINDS-AIREN | 1998-2001 | Male 55-64 Male 65-74 Male 75-84 Male 85+ Male Overall Female 55-64 Female 65-74 Female 75-84 Female 85+ Female Overall 55-64 65-74 75-84 85+ Overall |
| Nabalamba (2010) | CANADA | 55+ | Cannot determine | Self-report of a condition (diagnosed by a health professional) | None | 2005 | Overall Male Female |
| Ng (2010) | SINGAPORE | 60+ | Registry | Health professional | DSM-IV | 2003 | 60-64 65-74 75-84 85+ Male Overall Female Overall |
| Nunes (2010) | PORTUGAL | 65+ | Other | Health professional Medical chart review Imaging test Other | DSM-IV-TR | 2003 | 55-59 60-64 65-69 70-74 75-79 Male Female Overall |
| Author, Date       | Country and Region | Age Range Studied | Data Source | Diagnosis Established by | Diagnostic Criteria | Years of Data Collection | Groups Studied                     |
|-------------------|--------------------|-------------------|-------------|--------------------------|---------------------|--------------------------|-----------------------------------|
| Perkins (2002)    | USA                | 65+               | Door-to-Door survey | Health professional Imaging | DSM-III-R; ICD-10   | 1997-1998                | Overall                           |
| Plassman (2007)   | USA                | 71+               | Door-to-Door survey | Health professional Medical chart review Other | DSM-III-R; DSM-IV   | 2002                     | 71-79 80-89 90+ Overall Male Overall Female Overall |
| Polvikoski (2001) | FINLAND Vantaa     | 85+               | Cannot determine | Health professional Medical chart review | NINDS-AIREN         | 1991                     | Overall 85-89 90+ Male 85-89 Male 90+ Male Overall Female 85-89 Female 90+ Female Overall |
| Prince (2008)     | CUBA               | 65+               | Cannot determine | Health professional Other | DSM-IV             | 2003                     | Overall                           |
| Rahkonen (2003)   | FINLAND Kuopio    | 71+               | Cannot determine | Health professional Medical chart review Other | DSM-IV             | 1998                     | Overall                           |
| Riedel-Heller (2000) | GERMANY        | 75+               | Door-to-Door survey Registry | Health professional | DSM-III-R           | 1997-1998                | Overall                           |
| Rovio (2005)      | FINLAND           | 65+               | Other           | Health Professional | DSM-IV             | 2000                     | Overall                           |
| Sanderson (2003)  | USA                | 65+               | Registry Administrative databases | Administrative data codes None | None                | 2003                     | Overall                           |
| Scazufca (2008)   | BRAZIL Sao Paulo  | 65+               | Door-to-Door survey | Health professional | DSM-IV             | 2003-2005                | Overall Female 65-69 Female 70-74 Female 75-79 Female 80-84 Female 85+ Male 65-69 Male 70-74 Male 75-79 Male 80-84 Male 85+ 65-69 70-74 75-79 80-84 85+ |
| Authors (Year) | Country/City | Age Group | Methodology | Diagnosis | Cutoff Years | Sexes | Other Notes |
|---------------|--------------|-----------|-------------|-----------|--------------|-------|-------------|
| Sekita (2010) | Japan Hisayama | 65+ Registry | Health professional Medical chart review | Hachinski | 1985 1992 1998 2005 | Overall Female Overall Male Overall |
| Senanarong (2001) | Thailand Amphoe Nakton Chaisi Amphoe Hang Chat Amphoe Muang | 55+ Door-to-Door survey | Health professional | DSM-IV | 1997-1999 | Overall |
| Senanarong (2001) | Thailand Amphoe Nakton Chaisi Amphoe Hang Chat Amphoe Muang | 60+ Door-to-Door survey | Health professional | None | 1995-1997 | Overall |
| Shaji (2005) | India Cochin | 65+ Door-to-Door survey | Health professional | ICD-10 | N/A | Overall Male 65-69 Male 70-74 Male 75-79 Male 80-84 Male 85-89 Male 90+ Male Overall Female 65-69 Female 70-74 Female 75-79 Female 80-84 Female 85-89 Female 90+ Female Overall 65-69 70-74 75-79 80-84 85-89 90+ |
| Sousa (2009) | Cuba Dominican Republic Urban China Urban India Urban Mexico Urban Peru Rural China Rural India Rural Mexico Rural Peru | 65+ Cannot determine | Health professional Other | DSM-IV | 2003-2005 | Overall |
| Spada (2009) | Italy Sicily San Teodoro | 65+ Door-to-Door survey Other | Health professional Other | NINDS-AIREN | 2005 | Overall Male 65-69 Male 70-74 Male 75-79 Male 80-84 Male 85-89 Male 90-94 Male Overall Female 65-69 |
| Suh (2002) | Korea Yonchon County | 65+ Door-to-Door survey | Health professional Medical chart review | NINDS-AIREN; Hachinski | 1996-1997 | Male 65-69 Male 70-74 Male 75-79 Male 80-84 Male 85-89 Male 90-94 Male Overall Female 65-69 |
| Author, Date | Country and Region | Age Range Studied | Data Source | Diagnosis Established by | Diagnostic Criteria | Years of Data Collection | Groups Studied |
|-------------|--------------------|-------------------|-------------|--------------------------|---------------------|--------------------------|----------------|
| Community Only | | | | | | | |
| Vas (2001) | INDIA Bombay Mumbai | 40+ | Door-to-Door survey Mailed survey Other | Health professional Imaging test | DSM-IV; Hachinski | 1991 | Female 70-74 Female 75-79 Female 80-84 Female 85-89 Female 90-94 Female Overall 65-69 70-74 75-79 80-84 85-89 90-94 Overall Male <49 Male 50-54 Overall Male 55-59 Male 60-64 Male 65-69 Male 70-74 Male 75-79 Male 80-84 Male 85+ Male Overall Female <49 Female 50-54 Female 55-59 Female 60-64 Female 65-69 Female 70-74 Female 75-79 Female 80-84 Female 85+ Female Overall <49 50-54 55-59 60-64 65-69 70-74 75-79 80-84 85+ 49+ 50+ 55+ 60+ 65+ 70+ 75+ 80+ 85+ |
| Study (Year) | Country | Age Range | Methodology | Health Professional | Database | Year | Age Groups |
|-------------|---------|-----------|-------------|---------------------|----------|------|------------|
| Wada-Isoe (2009) | JAPAN | Amino-Cho | 40+ | Door-to-Door survey | Health professional | Other | NINDS-AIREN | 2008 | 65-69, 70-74, 75-79, 80-84, 85-89, 90+ Overall Male 65-69, Male 70-74, Male 75-79, Male 80-84, Male 85-89, Male 90+ Male Overall Female 65-69, Female 70-74, Female 75-79, Female 80-84, Female 85-89, Female 90+ Female Overall |
| Wakutani (2007) | JAPAN | Daisen-Cho | 65+ | Hospital/clinic chart review | Health professional | Hachinski | 1980, 1990, 2000 | Overall |
| Wangtongkum (2008) | THAILAND | Chian Mai province | 45+ | Door-to-Door survey | Health professional | Imaging test | Other | NINDS-AIREN | 2004-2005 | Overall |
| Wertman (2007) | ISRAEL | | 65+ | Other | Health professional | Other | DSM-IV | 2002 | Overall Male Overall Female Overall 65-69, 70-74, 75-79, 80-84, 85+ |
| Xu (2009) | SWEDEN | | 65+ | Registry Telephone survey | Health professional | Other | NINDS-AIREN | 1998-2001 | Overall Female Overall Male Overall |
| Yamada (2001) | JAPAN | Amino-Cho | 65+ | Door-to-Door survey | Health professional | Imaging test | Other | NINDS-AIREN | 1998 | Male Overall Female Overall Male 65-69, 70-74, 75-79, 80-84, 85-89, 90-94, 95-99 Female 65-69, Female 70-74 |
| Author, Date | Country and Region | Age Range Studied | Data Source | Diagnosis Established by | Diagnostic Criteria | Years of Data Collection | Groups Studied |
|--------------|--------------------|-------------------|-------------|--------------------------|---------------------|--------------------------|----------------|
| Zhao (2010)  | CHINA Shanghai     | 55+               | Door-to-Door survey | Health professional | NINDS-AIREN         | 1997-1998                | Overall Male 55-59 Male 60-64 Male 65-69 Male 70-74 Male 75-79 Male 80-84 Male 90+ Male Overall Female 55-59 Female 60-64 Female 65-69 Female 70-74 Female 75-79 Female 80-84 Female 85-89 Female 90+ Female Overall 65+ 70+ 75+ 80+ 85+ |
| Zhou (2006)  | CHINA              | 55+               | Other        | Health professional | DSM-IV; Hachinski   | 1999                     | Overall Male 55-54 Male 55-59 Male 60-64 Male 65-69 Male 70-74 Male 75-79 Male 80-84 Male Overall Female 55-54 Female 55-59 Female 60-64 Female 65-69 Female 70-74 Female 75-79 Female 80-84 55-54 55-59 60-64 65-69 70-74 75-79 80-84 |
| Study | Country | Age Group | Data Collection Method | Health Professional | Diagnostic Criteria | Time Period | Population |
|-------|---------|-----------|------------------------|---------------------|--------------------|-------------|------------|
| Zuliani (2010) | ITALY | 55+ | Door-to-Door survey | Health professional | DSM-IV | 1998-2000 | Overall |
| Aguero-Torres (2001) | SWEDEN | 75+ | Registry | Health professional | DSM-III-R | 1987-1990 | Overall |
| Andersen-Ranberg (2001) | DENMARK | 100+ | Registry | Health professional | ICD-10 | 1995-1996 | Overall |
| Arslantas (2009) | TURKEY | 55+ | Door-to-Door survey | Health professional | DSM-IV | 2002-2004 | Overall |
| Benedetti (2002) | ITALY | 75+ | Door-to-Door survey | Health professional | DSM-III-R | 1996 | Overall |
| Borroni (2011) | ITALY | 75+ | Registry | Health professional | NINCDS-ADRDA | 2009 | Overall |
| Camicioli (2000) | USA | 65+ | Administrative database | Medical chart review | NINCDS-ADRDA | 1994 | Overall |
| Chien (2008) | TAIWAN | 65+ | Administrative databases | Administrative data codes | None | 1996-2003 | Overall |
| Corrada (2008) | UNITED STATES | 75+ | Door-to-Door survey | Health professional | DSM-IV | 2006 | Overall |
| Author, Date       | Country and Region                      | Age Range Studied | Data Source               | Diagnosis Established by | Diagnostic Criteria | Years of Data Collection | Groups Studied              |
|-------------------|----------------------------------------|-------------------|---------------------------|--------------------------|---------------------|--------------------------|-----------------------------|
| Community Only    |                                        |                   |                           |                          |                     |                          | Male 90-91, Male 92-93, Male 94-95, Male 96-97, Male 98-99, Male 100+ |
| Di Carlo (2002)   | ITALY                                  | 65+               | Door-to-Door survey Registry | Health professional Medical chart review | ICD-10              | 1995                     | Male 65-69, Male 70-74, Male 75-79, Male 80-84, Overall Male Female 65-69, Female 70-74, Female 75-79, Female 80-84, Female Overall 65-69, 70-74, 75-79, 80-84, Overall |
| Ebly (1994)       | CANADA                                 | 85+               | Other                     | Health professional      | ICD-10              | 1990-1992                | Male 85-89, Male 90-94, Male 95+, Male Overall Female 85-89, Female 90-94, Female 95+, Female Overall 85-89, 90-94, 95+ Overall |
| Gascon-Bayarri (2007) | SPAIN                                      | 70+               | Door-to-Door survey Mailed survey Telephone survey | Health professional | DSM-IV              | 2002-2003                | Male 70-74, Male 75-79, Male 80-84, Male 85-89, Male 90+, Male Overall Female 70-74, Female 75-79, Female 80-84, Female 85-89, Female 90+, Overall Female 70-74, 75-79, 80-84, 85-89, 90+ Overall |
| Studies          | Country | Age Group | Methodology                  | Diagnostic Tool | Time Period | Male Overall | Female Overall |
|------------------|---------|-----------|------------------------------|-----------------|-------------|--------------|----------------|
| Gavrila (2009)   | Spain   | 70+       | Door-to-Door survey Registry | Health professional | DSM-IV      | 2003-2005    |                |
| Gislason (2003)  | Sweden  | 85+       | Registry                     | Health professional | DSM-III-R   | 1986-1987    |                |
| Graham (1997)    | Canada  | 65+       | Administrative Databases     | Health professional | DSM-III     | 1991         |                |
| Harvey (2003)    | England | 70+       | Registry                     | Health professional | DSM-IV      | N/A          |                |
| Helmer (2006)    | France  | 75+       | Door-to-Door survey Other    | Health professional | DSM-III-R   | 1998-1999    |                |
| Ikejima (2009)   | Japan   | 65+       | Mailed survey                | Medical chart review | DSM-III-R   | 2006         |                |
| Author, Date | Country and Region | Age Range Studied | Data Source | Diagnosis Established by | Diagnostic Criteria | Years of Data Collection | Groups Studied |
|-------------|--------------------|-------------------|-------------|--------------------------|---------------------|-------------------------|----------------|
| Community Only |                    |                   |             |                          |                     |                         |                |
| Juva (2000) | FINLAND Vantaa     | 85+               | Registry    | Health professional      | DSM-III-R           | 1991                    | Overall Female Overall Male Overall |
| Kahana (2003) | ISRAEL Ashkelon  | 75+               | Door-to-Door survey | Health professional | DSM-III-R           | 1989                    | Male 76-77 Male 78-79 Male 80-81 Male 82-83 Male 84-85 Male 86-89 Male 90+ Male Overall Female 76-77 Female 78-79 Female 80-81 Female 82-83 Female 84-85 Female 86-89 Female 90+ Female Overall 76-77 78-79 80-81 82-83 84-85 86-89 90+ Overall |
| Livingston (2001) | UK London Islington | 60+               | Door-to-Door survey | Health professional | None               | N/A                     | Overall |
| Lovheim (2008) | SWEDEN            | 85+               | Other        | Health professional      | DSM-IV              | 2005-2006               | Overall |
| Luck (2008) | GERMANY Saxony Leipzig | 75+              | Door-to-Door survey | Health professional | SIDAM               | 1997-1998               | Overall |
| Manton (2005) | USA               | 65+               | Registry     | Cannot determine         | None                | 1982-1999               | Overall |
| Phung (2010) | DENMARK           | 40+               | Registry     | Administrative data codes | None               | 1970-2004               | Overall 40-49 50-59 60-64 65-69 |
| Riedel-Heller (2001) | GERMANY | Leipzig | 7+ Registry | Health professional | DSM-III-R | 1997-1998 |
|---------------------|---------|---------|-------------|---------------------|-----------|------------|
| Rockwood (2000)     | CANADA  | 65+ Other | Health professional | DSM-III-R | 1991-1992 | Overall 65-74 75-84 85+ Male Overall Female Overall |
|                     |         |         |             |                     |           |            |
Table 1. (Continued)

| Author, Date | Country and Region | Age Range Studied | Data Source          | Diagnosis Established by          | Diagnostic Criteria | Years of Data Collection | Groups Studied |
|--------------|--------------------|-------------------|----------------------|-----------------------------------|---------------------|--------------------------|----------------|
| Sahadevan (2008) | SINGAPORE | 50+ | Door-to-Door survey | Health professional Other | NINDS-AIREN | 2001 | Overall Male Overall Female Overall 50-59 60-69 70-79 80+ 50-54 55-59 60-64 65-69 70-74 75-79 80-84 85+ Female 50-54 Female 55-59 Female 60-64 Female 65-69 Female 70-74 Female 75-79 Female 80-84 Female 85+ Male 50-54 Male 55-59 Male 60-64 Male 65-69 Male 70-74 Male 75-79 Male 80-84 Male 85+ |
| Silver (2001) | USA 8 towns near Boston, MA | 65+ | Registry | Health professional | DSM-IV | 1996 | Overall |
| Stevens (2002) | UK London Islington | 65+ | Door-to-Door survey | Health professional Medical chart review Other | NINDS-AIREN | N/A | Overall |
| van Exel (2002) | THE NETHERLANDS Leiden | 85+ | Door-to-Door survey | Medical chart review Other | None | 1997-1999 | Overall |
| von Heidken (2006) | SWEDEN Umea | 40+ | Other | Health professional Medical chart review Other | None | 2000 | Overall 90 95+ Male Overall Female Overall |
| Wancata (2007) | SWEDEN Gothenburg | 70 | Other | Health professional | DSM-IV | 2000 | Overall |
| Institution Only | Study Location | Age Group | Data Collection Method | Diagnostic Criteria | Year | Gender Distribution |
|------------------|----------------|-----------|------------------------|---------------------|------|---------------------|
| Chen (2007)      | TAIWAN         | 65+       | Other                  | Health professional | DSM-IV | N/A                  | Male Overall | Female Overall | Overall |
| Feldman (2006)   | ISRAEL         | N/A       | Hospital/clinic chart review | Health professional | Medical chart review | DSM-IV | 1999 | Overall |
| Magaziner (2000) | USA            | 65+       | Other                  | Health professional | Medical chart review | DSM-III-R | 1992-1995 | Overall |
| Martens (2007)   | CANADA         | 55+       | Administrative Databases | Administrative data codes | ICD-9-CM | 1997-2002 | Male 55-59 | Male 60-64 | Male 65-69 | Male 70-74 | Male 75-79 | Male 80-89 | Male 90+ | Female 55-59 | Female 60-64 | Female 65-69 | Female 70-74 | Female 75-79 | Female 80-89 | Female 90+ |
| Matthews (2002)  | UK             | 65+       | Registry               | Health professional | None | 1991-1993 | Male 65-74 | Male 75-84 | Male 85+ | Male Overall | Female 65-74 | Female 75-84 | Female 85+ | Female Overall | 65-74 | 75-84 | 85+ | Overall |
| Rosenblatt (2004)| USA            | 55+       | Other                  | Health professional | Medical chart review | NINDS-AIREN | N/A | Overall |
Table 2: Studies Reporting on the Incidence Rate of Dementia

| Author, Date       | Country          | Age Range Studied | Data Source          | Diagnosis Established by                  | Diagnostic Criteria | Years of Data Collection | Groups Studied                  |
|--------------------|------------------|-------------------|----------------------|------------------------------------------|--------------------|--------------------------|---------------------------------|
| Bermejo-Pareja (2009) | SPAIN Las Margaritas, Lista, Arevalo | 65+ | Door-to-Door survey Mailed survey | Health professional Administrative data codes Medical chart review | DSM-IV             | 1994 | Overall Male 65-69 Male 70-74 Male 75-79 Male 80-84 Male 85-89 Male 90+ Male Overall Female 65-69 Female 70-74 Female 75-79 Female 80-84 Female 85-89 Female 90+ Female Overall 65-69 70-74 75-79 80-84 85-89 90+ Overall |
| Fitzpatrick (2004)  | USA              | 65+ | Door-to-Door survey | Health professional Imaging test | DSM-IV             | 1992-1994 | Overall Male <75 75-79 80-84 85+ Female <75 Female 75-79 Female 80-84 Female 85+ Female Overall Male <75 Male 75-79 Male 80-84 Male 85+ Male Overall |
| Fuhrer (2003)       | FRANCE Gironde and Dordogne | 65+ | Door-to-Door survey Registry | Health professional Imaging test | DSM-III-R         | 1988-1997 | Overall |
| Kukull (2002)       | USA Washington Seattle | 65+ | Door-to-Door survey Other | Health professional Imaging test Other | DSM-IV             | 1994 | 65-69 70-74 75-79 80-84 85-89 90+ Overall |
| Study | Country | Age | Data Source | Health Care Professional | Diagnostic Criteria | Time Period | Gender Description |
|-------|---------|-----|-------------|--------------------------|--------------------|-------------|-------------------|
| Kuller (2005) | USA | <70-80+ | Administrative Databases | Health professional | Medical chart review | Imaging | NINCDS-ADRDA | 1998-1999 | Male Overall Female Overall <70 70-74 75-79 80+ Overall |
| Larrieu (2004) | FRANCE | 65+ | Registry | Health professional | NINCDS-ADRDA | 1993-1998 | Overall |
| Li (2007) | USA | 65+ | Door-to-Door survey | Health professional | DSM-IV | 1994-1996 | Overall |
| Lopez (2003) | USA | 65+ | Administrative Databases | Health professional | DSM-IV | 1998-1999 | Male Female Overall |
| Matsui (2009) | JAPAN | 65+ | Registry | Health professional | DSM-III-R | 1985-2002 | Overall |
| Meguro (2007) | | | | | | 2003 | Overall Male 65-69 Male 70-79 Male 80+ Female 65-69 Female 70-79 Female 80+ |
| Mercy (2008) | UK | 65+ | Other | Health professional | DSM-IV | 2000-2006 | Overall |
| Nitrini (2004) | BRAZIL | 65+ | Door-to-Door survey | Health professional | DSM-IV | 1997-2000 | Female 65-69 Female 70-74 Female 75-79 Female 80-84 Female 85-89 Female 90+ Male 65-69 Male 70-74 Male 75-79 Male 80-84 Male 85-89 Male 90+ 65-69 70-74 75-79 80-84 85-89 90+ Overall |
| Polvikoski (2006) | FINLAND | 85+ | Cannot determine | Health professional | Medical chart review | DSM-III-R | 2001 | Male 85-89 Male 90+ Male Overall Female 85-89 Female 90+ Female Overall 85-89 90+ Overall |
Table 2. (Continued)

| Author, Date | Country | Age Range Studied | Data Source | Diagnosis Established by | Diagnostic Criteria | Years of Data Collection | Groups Studied |
|--------------|---------|-------------------|-------------|--------------------------|---------------------|--------------------------|----------------|
| Ravaglia (2005) | ITALY Conselice Ravenna Emilia Romagna region | 85+ | Door-to-Door survey Registry | Health professional Medical chart review Imaging test | NINDS-AIREN | 1999-2004 | Male 65-74 Male 75-84 Female 85-94 Male Overall Female 65-74 Female 75-84 Female 85-94 Female Overall Overall 65-74 75-84 85-94 |
| Ravaglia (2005) | ITALY Conselice Ravenna Emilia Romagna region | 65+ | Door-to-Door survey Registry | Health professional Medical chart review Imaging test | NINDS-AIREN | 2003-2004 | Male 65-74 Male 75-84 Male 85-94 Male Overall Female 65-74 Female 75-84 Female 85-94 Female Overall Overall 65-74 75-84 85-94 |
| Ravalglia (2008) | ITALY Conselice Ravenna Emilia Romagna region | 85+ | Door-to-Door survey Registry | Health professional Medical chart review Imaging test | DSM-IV | 1999-2004 | Overall |
| Samieri (2008) | FRANCE Bordeaux | 65+ | Cannot determine | Health professional | DSM-IV | 2003 | Overall |
| Tyas (2006) | CANADA Manitoba | 65+ | Registry Administrative databases | Health professional Other | DSM-III-R; DSM-IV | 1991-1992; 1996-1997 | Male 65-69 Male 70-74 Male 75-79 Male 80-84 Male 85-89 Male 90+ Male Overall Female 65-69 Female 70-74 Female 75-79 Female 80-84 Female 85-89 Female 90+ Female Overall 65-69 70-74 75-79 80-84 85-89 90+ Overall |
|                          | Country       | Age  | Data Collection Method          | Source of Data     | Diagnosis Method | Year   | Sex Groups                                      |
|--------------------------|---------------|------|---------------------------------|--------------------|------------------|--------|------------------------------------------------|
| Waite (2001)             | AUSTRALIA     | 40+  | Door-to-Door survey             | Census             | Health professional | DSM-IV | 1991-1994                                      |
|                          | Sydney        |      |                                 |                    |                  |        | Female 75-79                                    |
|                          |               |      |                                 |                    |                  |        | Female 80-84                                    |
|                          |               |      |                                 |                    |                  |        | Female 85-89                                    |
|                          |               |      |                                 |                    |                  |        | Female 90+                                      |
|                          |               |      |                                 |                    |                  |        | Female Overall                                  |
|                          |               |      |                                 |                    |                  |        | Male 75-79                                      |
|                          |               |      |                                 |                    |                  |        | Male 80-84                                      |
|                          |               |      |                                 |                    |                  |        | Male 85-89                                      |
|                          |               |      |                                 |                    |                  |        | Male 90+                                        |
|                          |               |      |                                 |                    |                  |        | Male Overall                                    |
|                          |               |      |                                 |                    |                  |        | 75-79                                          |
|                          |               |      |                                 |                    |                  |        | 80-84                                          |
|                          |               |      |                                 |                    |                  |        | 85-89                                          |
|                          |               |      |                                 |                    |                  |        | 90+                                            |
|                          |               |      |                                 |                    |                  |        | Overall                                         |
| Community & Institution  |               |      |                                 |                    |                  |        |                                                |
| Corrada (2010)           | USA           | 75+  | Door-to-Door survey             | Telephone survey   | Health professional | DSM-IV | 2003-2007                                      |
|                          |               |      |                                 |                    |                  |        | Male 90-94                                      |
|                          |               |      |                                 |                    |                  |        | Male 95-99                                      |
|                          |               |      |                                 |                    |                  |        | Male 100+                                       |
|                          |               |      |                                 |                    |                  |        | Male 90+                                        |
|                          |               |      |                                 |                    |                  |        | Female 90-94                                    |
|                          |               |      |                                 |                    |                  |        | Female 95-99                                    |
|                          |               |      |                                 |                    |                  |        | Female 100+                                     |
|                          |               |      |                                 |                    |                  |        | Female 90+                                      |
|                          |               |      |                                 |                    |                  |        | 90-94                                          |
|                          |               |      |                                 |                    |                  |        | 95-99                                          |
|                          |               |      |                                 |                    |                  |        | 100+                                           |
|                          |               |      |                                 |                    |                  |        | 90+                                            |
| Di Carlo (2000)          | ITALY         | 65+  | Door-to-Door survey             | Registry           | Health professional | DSM-III-R | 1992                                            |
|                          | Genoa, Segrates (Milan), Selvazzano-Rubano (Padua), Impruneta (Florence), Fermo (Ascoli Piceno), Naples, Casamassima (Bari), and Catania | | | Medical chart review | | | Male 65-69                                    |
|                          |               |      |                                 |                    |                  |        | Male 70-74                                      |
|                          |               |      |                                 |                    |                  |        | Male 75-79                                      |
|                          |               |      |                                 |                    |                  |        | Male 80-84                                      |
|                          |               |      |                                 |                    |                  |        | Male Overall                                    |
|                          |               |      |                                 |                    |                  |        | Female 65-69                                    |
|                          |               |      |                                 |                    |                  |        | Female 70-74                                    |
|                          |               |      |                                 |                    |                  |        | Female 75-79                                    |
|                          |               |      |                                 |                    |                  |        | Female 80-84                                    |
|                          |               |      |                                 |                    |                  |        | Female Overall                                  |
|                          |               |      |                                 |                    |                  |        | 65-69                                          |
|                          |               |      |                                 |                    |                  |        | 70-74                                          |
|                          |               |      |                                 |                    |                  |        | 75-79                                          |
|                          |               |      |                                 |                    |                  |        | 80-84                                          |
|                          |               |      |                                 |                    |                  |        | Overall                                         |
| Edland (2002)            | UNITED STATES | 65+  | Hospital/Clinic chart review    | Administrative Databases | Medical chart review | DSM-IV | 1985-1989                                      |
|                          | Minnesota     |      |                                 |                    |                  |        | Female 50-54                                    |
|                          | Rochester     |      |                                 |                    |                  |        | Female 55-59                                    |
|                          |               |      |                                 |                    |                  |        | Female 60-64                                    |
|                          |               |      |                                 |                    |                  |        | Female 65-69                                    |
|                          |               |      |                                 |                    |                  |        | Female 70-74                                    |
|                          |               |      |                                 |                    |                  |        | Female 75-79                                    |
|                          |               |      |                                 |                    |                  |        | Female 80-84                                    |
|                          |               |      |                                 |                    |                  |        | Female 85-89                                    |
|                          |               |      |                                 |                    |                  |        | Female 90-94                                    |
|                          |               |      |                                 |                    |                  |        | Female 95-99                                    |
|                          |               |      |                                 |                    |                  |        | Female Overall                                  |
|                          |               |      |                                 |                    |                  |        | 50-54                                          |
|                          |               |      |                                 |                    |                  |        | 55-59                                          |
|                          |               |      |                                 |                    |                  |        | 60-64                                          |
|                          |               |      |                                 |                    |                  |        | 65-69                                          |
|                          |               |      |                                 |                    |                  |        | 70-74                                          |
|                          |               |      |                                 |                    |                  |        | 75-79                                          |
|                          |               |      |                                 |                    |                  |        | 80-84                                          |
|                          |               |      |                                 |                    |                  |        | Overall                                         |
| Author, Date | Country | Age Range Studied | Data Source | Diagnosis Established by | Diagnostic Criteria | Years of Data Collection | Groups Studied |
|--------------|---------|-------------------|-------------|--------------------------|---------------------|-------------------------|---------------|
| Knopman (2002) | USA Minnesota Rochester | 75+ | Administrative Databases | Medical chart review | DSM-IV | 1985-1989 | Male 70-74 Male 75-79 Male 80-84 Male 85-89 Male 90-94 Male 95-99 Male Overall 50-54 55-59 60-64 65-69 70-74 75-79 80-84 85-89 90-94 95-99 Overall |
| Study                        | Country       | Age Group | Data Source               | Data Review Method | Diagnostic System | Year Range     |
|------------------------------|---------------|-----------|----------------------------|--------------------|------------------|----------------|
| Knopman (2002)              | USA           | 75+       | Administrative Databases   | Medical chart review | DSM-IV           | 1985-1989      |
|                              |               |           |                            |                    |                  |                |
| Knopman (2004)              | USA           | 75+       | Administrative Databases   | Medical chart review | DSM-IV           | 1990-1994      |
|                              |               |           |                            |                    |                  | Overall         |
| Matthews (2005)             | UK            | 65+       | Registry                   | Health professional | DSM-III-R        | 1990-1996      |
|                              |               |           |                            |                    |                  | Overall         |
| McDowell (2007)             | CANADA        | 65+       | Other                      | Health professional | DSM-IV           | 1991-2001      |
|                              |               |           |                            |                    |                  | Overall         |
| Riedel-Heller (2001)        | GERMANY Leipzig | 75+       | Registry                   | Health professional | DSM-III-R        | 1997-1998      |
|                              |               |           |                            |                    |                  | Overall         |
| Author, Date      | Country      | Age Range Studied | Data Source                | Diagnosis Established by | Diagnostic Criteria | Years of Data Collection | Groups Studied       |
|------------------|--------------|-------------------|----------------------------|--------------------------|---------------------|--------------------------|----------------------|
| Ruitenberg (2001) | NETHERLANDS  | 55+               | Door-to-Door survey        | Health professional      | NINDS-AIREN         | 1990-1999                | Female 55-59 Male 55-59 Female 60-64 Female 65-69 Female 70-74 Female 75-79 Female 80-84 Female 85-89 Female 90-94 Female 95+ Male Overall Male 55-59 Male 60-64 Male 65-69 Male 70-74 Male 75-79 Male 80-84 Male 85-89 Male 90-94 Male 95+ Male Overall 55-59 60-64 65-69 70-74 75-79 80-84 85-89 90-94 95+ Overall |
|                  | Rotterdam    |                   |                            | Medical chart review     |                     |                          |                      |
|                  | Ommoord      |                   |                            | Imaging test             |                     |                          |                      |
| Garre-Olmo (2010) | SPAIN        | 30+               | Registry                   | Health professional      | DSM-IV-TR           | 2007-2009                | 30-64 65+ 30-34 35-39 40-44 45-49 50-54 55-59 60-64 Male 30-34 Male 35-39 Male 40-44 Male 45-49 Male 50-54 Male 55-59 Male 60-64 Male 30-64 Female 30-34 Female 35-39 Female 40-44 Female 45-49 Female 50-54 Female 55-59 Female 60-64 |
|                  | Catolonia    |                   |                            | Medical chart review     |                     |                          |                      |
|                  |              |                   |                            | Imaging test             |                     |                          |                      |
|                  |              |                   |                            |                          |                     |                          |                      |
| Author, Date | Country | Age Range Studied | Data Source | Diagnosis Established by | Diagnostic Criteria | Years of Data Collection | Groups Studied |
|--------------|---------|------------------|-------------|--------------------------|---------------------|--------------------------|----------------|
| **Community Only** | | | | | | | |
| Arai (2004) | JAPAN Hokkaido Minami Furano Town Hokkaido | 65+ | Door-to-Door survey | Health professional | None | 1998-2002 | Overall Male Female 65-69 70-74 75-79 80-84 85+ |
| Canadian Study of Health and Aging Working Group (2000) | CANADA | 65+ | Administrative databases | Health professional | DSM-III-R | 1996 | Male 65-69 Male 70-74 Male 75-79 Male 80-84 Male 85-89 Male 90-94 Male 95+ Female 65-69 Female 70-74 Female 75-79 Female 80-84 Female 85-89 Female 90-94 Female 95+ |
| Cornelius (2004) | SWEDEN Stockholm Kungsholmen district | 75+ | Cannot determine | Health professional Medical chart review | DSM-III-R | 1991-1993 1994-1996 | Overall |
| Forti (2010) | ITALY | 65+ | Registry | Health professional Imaging test | DSM-IV | 2003-2004 | <75 75+ |
| Ganguli (2000) | USA Pennsylvania Mononagahela Valley | 65+ | Door-to-Door survey Registry | Health professional Medical chart review | DSM-III-R | 1997-1999 | 65-69 70-74 75-79 80-84 85-89 90+ Overall Male 65-69 Male 70-74 Male 75-79 Male 80-84 Male 85-89 Male 90+ Male Overall Female 65-69 Female 70-74 Female 75-79 Female 80-84 Female 85-89 Female 90+ Female Overall |
| Hendrie (2001) | NIGERIA Ibadan Idfkan area | 65+ | Door-to-Door survey | Health professional Imaging test | DSM-III-R | 1997-1998 | 65-74 75-84 85+ Overall |
| Author, Date   | Country | Age Range Studied | Data Source | Diagnosis Established by | Diagnostic Criteria | Years of Data Collection | Groups Studied                      |
|---------------|---------|-------------------|-------------|---------------------------|---------------------|--------------------------|-------------------------------------|
| Kawas (2000)  | USA     | 75+               | Cannot determine | Health professional | DSM-III-R       | 1985-1998                | Overall Male 55-59 Male 60-64 Male 65-69 Male 79-74 Male 75-79 Male 80-84 Male 85+ Male Overall Female 55-59 Female 60-64 Female 65-69 Female 70-64 Female 75-79 Female 80-84 Female 85+ Female Overall 55-59 60-64 65-69 70-74 75-79 80-84 85+ |
| Knopman (2003) | USA     | 50+               | Door-to-Door survey Registry | Health professional | DSM-IV          | 1985-1989                | Overall                             |
| Kuller (2005)  | USA     | <70-80+           | Administrative Databases | Health professional | None            | 1998-1999                | Overall                             |
| Lopez (2005)   | USA     | 65+               | Administrative Databases | Health professional | DSM-IV          | 1994-1999                | Overall                             |
| Lopez-Pousa (2004) | SPAIN  | 75+               | Door-to-Door survey | Health professional | DSM-II-R        | 1990-1991                | Male 75-79 Male 80-84 Male 85-89 Male 90+ Male Overall Female 75-79 Female 80-84 Female 85-89 Female 90+ Female Overall 75-79 80-84 85-89 90+ Overall |
| Miech (2002)   | USA     | 65+               | Door-to-Door survey | Health professional | DSM-III-R       | 1998-1999                | Overall Male Overall Female Overall Overall |
In the 50 studies that reported on the period prevalence of dementia, the majority (n = 39) used a single source of the study population, including door-to-door surveys (n = 21), registries (n = 8), other sources (n = 4), administrative databases (n = 2) and a census (n = 1). It was not possible to determine the data source in three studies. Twenty-six of the 50 included studies used a single methodology to identify cases—the majority used a standardized assessment by a health professional (n = 22), followed by administrative data codes (n = 3). It was not possible to determine how they identified cases in one study.

In community-only settings (n = 14), the pooled annual period prevalence per 1000 was 69.07 (CI95%: 52.36-91.11) compared to 72.66 (CI95%: 42.96-122.91) per 1000 in an institutional sample from the United Kingdom.14

Incidence of Dementia

Seventeen studies reported on the incidence proportion of dementia,10,138,140,142,146,148,150,151,155,157,159,165,175,176,183 with 10 eligible for inclusion in the meta-analysis of those aged 60+, 65+ or 70+ years.139,140,148,150,157,159,165,175,176,183 All were from community settings. Of 17 studies reporting on the incidence proportion of dementia, 16 used a single methodology to recruit participants, most frequently door-to-door survey (n = 5). Other approaches included administrative databases (n = 3), registries (n = 2), hospital/clinic chart reviews (n = 1) and other methods (n = 1). It was not possible to determine the data source in two cases, and one study used another methodology. In order to ascertain cases, most studies (n = 11) used multiple sources of data (e.g., healthcare professional diagnosis and imaging test results). Six studies based the case ascertainment purely on a healthcare professional assessment.

A random-effects model found that the overall pooled incidence proportion of dementia per 1000 was 52.85 (CI95%: 33.08-84.42) (Figure 4). Among the included studies, incidence proportion estimates ranged from 8.70 in a Japanese study139 to 142.22 per 1000 in a U.S. one.157

Thirty-two studies reported on the incidence rate of dementia,7,8,141,143-145,147,149,152-154,156,158,160-164,166,168-174,177,182 with nine
The majority of the 32 studies reporting on the incidence rate of dementia used a single source to identify their population \((n = 21)\)—these sources were door-to-door surveys \((n = 8)\), registries \((n = 6)\), administrative databases \((n = 3)\) and other sources in two studies. It was not possible to determine the
### Community

| Study          | Country         | Period Prevalence | 95% CI         |
|----------------|-----------------|-------------------|----------------|
| Scapula (2006) | Brazil          | 51.00             | [42.16; 61.70] |
| Sousa (2009)   | Cuba            | 109.00            | [98.10; 121.12]| +  |
| Sousa (2009)   | Dominican Republic | 120.00          | [106.33; 135.42]|   |
| Das (2008)     | India           | 7.92              | [5.88; 10.66]  | +  |
| Ganguli (2000) | India           | 6.09              | [5.84; 11.20]  | +  |
| Cristina (2001)| Italy           | 57.49             | [47.34; 69.81] | +  |
| Zuliani (2010) | Italy           | 58.04             | [45.49; 74.05] | +  |
| Jhoo (2008)    | Korea           | 52.00             | [37.84; 71.47] | +  |
| Lee (2002)     | Korea           | 91.00             | [72.45; 114.29]| +  |
| Kim (2003)     | Korea           | 74.48             | [60.48; 91.72] | +  |
| Gureje (2006)  | Nigeria         | 101.00            | [86.22; 118.31]| +  |
| Sousa (2009)   | Rural China     | 56.00             | [43.36; 72.30] | +  |
| Sousa (2009)   | Rural India     | 108.00            | [89.55; 130.25]| +  |
| Sousa (2009)   | Rural Mexico    | 87.00             | [70.53; 107.32]| +  |
| Sousa (2009)   | Rural Peru      | 65.00             | [47.02; 89.86] | +  |
| Xu (2009)      | Sweden          | 34.11             | [31.20; 37.28] | +  |
| Sousa (2009)   | Urban China     | 73.00             | [59.09; 90.19] | +  |
| Sousa (2009)   | Urban India     | 75.00             | [59.55; 94.46] | +  |
| Sousa (2009)   | Urban Mexico    | 93.00             | [75.93; 113.90]| +  |
| Sousa (2009)   | Urban Peru      | 94.00             | [78.29; 112.86]| +  |
| Langa (2005)   | USA             | 174.01            | [157.22; 192.60]| + |
| Li (2007)      | USA             | 161.29            | [147.10; 176.85]| + |
| Lopez (2003)   | USA             | 193.28            | [180.89; 206.50]| + |
| Sousa (2009)   | Venezuela       | 74.00             | [63.20; 86.65] | +  |

#### Pooled Totals

- **Community:** 69.07 [52.36; 91.11]
- **Community & Institution:** 72.66 [42.96; 122.91]

### Institution

| Study          | Country | Period Prevalence | 95% CI         |
|----------------|---------|-------------------|----------------|
| Matthews (2002)| UK      | 593.00            | [528.38; 665.52]| +  |
| Magaziner (2000)| USA   | 482.00            | [438.00; 530.42]| +  |

#### Pooled Totals

- **Institution:** 533.24 [435.25; 653.28]

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**Figure 3:** Pooled period prevalence of dementia.
data source in another two studies. Fifteen of the 32 studies used a single methodology to identify cases, including a standardized assessment by a health professional (n = 10), chart review (n = 4) and administrative data codes (n = 1). The remaining 17 used multiple sources.

In community-only settings, the pooled incidence rate of dementia per 1000 person-years was 17.18 (CI95%: 13.90-21.23). In a single combined community and institution study, the estimated incidence rate was 13.33 per 1000 person-years (CI95%: 11.18-15.89) (there were no institution-only studies) (Figure 5). The incidence rate estimates ranged from 8.11 per 1000 person-years in a community-only study from the Netherlands178 to 37.80 per 1000 person-years in a community-only study from Italy.170

Sources of Heterogeneity

In our exploration of sources of heterogeneity, we restricted our analyses to studies reporting on individuals 60+, 65+ or 70+ in order to minimize the potential confounding effects of age. Because of the small number of studies, we could not explore the interaction between the potential sources of heterogeneity.

Age

Using the youngest-aged person in a study to assess this characteristic, a series of meta-regression analyses revealed that increasing age was significantly associated (p < 0.001) with a higher prevalence or incidence of dementia.

Sex

Meta-regression showed no statistically significant differences between the sexes on any of our estimates, though estimates were consistently higher in females (p > 0.05).

Setting

Point Prevalence. Estimates from institution-only settings were significantly higher than those from community-only and combined community and institution settings (p < 0.0001). The difference in point prevalence in combined community and institutional settings (57.98 [CI95%: 42.02-80.00] per 1000) compared to community-only ones (48.62 [CI95%: 41.98-56.32] per 1000) was not statistically significant (p = 0.33).

Annual Period Prevalence. No significant difference in pooled estimates of annual period prevalence was found between community-only (70.86 [CI 95%: 55.78-90.03] per 1000) and combined community and institution settings (72.66 [CI 95%: 42.96-122.91] per 1000). Annual period prevalence was significantly higher in institution-only settings (533.24 [CI 95%: 435.25-653.28] per 1000, p < 0.0001).

Incidence Proportion and Rate. Estimates for incidence proportion were derived solely from community-only settings. There was an insufficient number of studies from non-community settings to assess incidence rate.

Diagnostic Criteria

Comparisons were restricted to studies done in the same setting (community-only, community and institution, institution-only) and where the specific criteria were utilized by more than one study.

Point Prevalence. In community-only settings, there were only sufficient studies for analysis using either DSM–IV (n = 16) or DSM–III–R (n = 4) diagnostic criteria. There was no significant difference (p = 0.33) in the pooled point prevalence estimates between these two criteria.

DSM–IV (n = 3) and DSM–III–R (n = 2) were the most commonly used criteria in combined community and institutional settings (and the only criteria eligible for inclusion). There was

| Study            | Country  | Incidence Proportion | 95% CI          |  |
|------------------|----------|----------------------|-----------------|---|
| Community        |          |                      |                 |---|
| Simons (2006)   | Australia| 101.60               | [91.02; 113.42] |---|
| Zuliani (2010)  | Italy    | 98.90                | [80.43; 121.61] |---|
| Arai (2004)     | Japan    | 8.70                 | [4.11; 18.38]   |---|
| Hendrie (2001)  | Nigeria  | 13.50                | [11.49; 15.88]  |---|
| Benito–Leon (2009) | Spain | 42.60               | [36.23; 50.10]  |---|
| Ganguli (2000)  | USA      | 21.10                | [16.06; 27.73]  |---|
| Kuller (2005)   | USA      | 142.22               | [130.91; 154.51]|---|
| Lopez (2005)    | USA      | 133.04               | [122.41; 144.59]|---|
| Mielke (2002)   | USA      | 55.93                | [48.62; 64.33]  |---|
| Seshadri (2002) | USA      | 102.02               | [85.53; 121.69] |---|
| Pooled Totals   |          | 52.85                | [33.08; 84.42]  |---|

Heterogeneity: I²=98.1%, Q=1012.3, df=9, p=0.0001

Figure 4: Pooled incidence proportion of dementia.
no significant difference ($p = 0.30$) in pooled point prevalence estimates between them.

**Annual Period Prevalence.** Community-only studies eligible for this analysis employed either DSM–III–R ($n = 4$) or the DSM–IV ($n = 11$) criteria. There was no significant difference ($p = 0.49$) between their estimates for the annual period prevalence.

**Incidence Proportion and Rate.** In community-only settings, the most commonly used criteria to determine incidence proportion were the DSM–III–R ($n = 3$) and the DSM–IV ($n = 4$). These pooled estimates of the incidence proportion differed significantly from each other, with estimates higher in DSM–IV studies ($p = 0.03$). The only available study for incidence rate used DSM–III–R criteria. Region Point Prevalence. Among community-only studies, there were no significant differences in pooled estimates between Asia ($n = 12$), Europe ($n = 7$), North America ($n = 4$) and South America ($n = 3$). There were no differences between Europe ($n = 3$) and North America ($n = 2$) in the pooled point prevalence of dementia among community and institutional studies. The institution-only estimates from North America ($n = 1$) and Asia ($n = 1$) were very similar.

**Annual Period Prevalence.** There were estimates from four continents for the annual pooled period prevalence of dementia in community-only studies (Asia [$n = 6$], Europe [$n = 3$], North America [$n = 4$], South America [$n = 2$]). The pooled North American annual estimate ($129.81$ [CI95%: 104.73-160.91] per 1000) was significantly higher than that of Asia ($45.24$ [CI95%: 25.91-78.99] per 1000), Europe ($47.98$ [CI95%: 31.95-72.07] per 1000) and South America ($69.63$ [CI95%: 53.28-91.00] per 1000).

**Incidence Proportion.** There were community-only studies from two continents (Europe [$n = 2$], North America [$n = 5$]). The estimates from North America ($75.48$ [CI95%: 47.37-120.28] per 1000) and Europe ($64.75$ [28.37-147.79] per 1000) were not significantly different ($p = 0.75$).

**Incidence Rate.** In community-only studies, there were estimates from two continents (Europe [$n = 5$], North America [$n = 3$]). There were no significant differences ($p = 0.18$) in the estimates among them.

**Year of Data Collection**

Meta-regression revealed that there were no significant changes over time in the incidence or prevalence of dementia.

**Publication Bias**

There was no evidence of publication bias with either Begg’s or Egger’s test for point prevalence ($p > 0.05$). Evidence of publication bias was found for the period prevalence on both Begg’s and Egger’s tests where smaller studies of the effect were potentially missing ($p < 0.0001$). For the incidence rate, there was no evidence of publication bias on either the Begg’s ($p > 0.05$) or Egger’s ($p > 0.05$) test. Evidence of publication bias was found for the incidence proportion using the Egger’s ($p = 0.037$) but not the Begg’s ($p > 0.05$) test.

**Study Quality**

The median study quality score was 6 (range 2-8). ANOVA testing did not reveal any statistical difference in study quality by continent (see Table 4 for details).

**DISCUSSION**

This systematic review and meta-analysis of the global incidence and prevalence of dementia provides overall estimates...
### Table 4: Quality assessment scores of dementia incidence and prevalence studies

| Study (Year)                                      | Q1: Target population described? | Q2: Cases from entire population or probability sampling? | Q3: Response rate >70%? | Q4: Non-responders clearly described? | Q5: Sample representative of population? | Q6: Data collection methods standardized? | Q7: Validated criteria to assess disease? | Q8: Were estimates given with confidence intervals or subgroups? | Total Quality Score (/8) |
|--------------------------------------------------|----------------------------------|----------------------------------------------------------|-------------------------|---------------------------------------|------------------------------------------|------------------------------------------|------------------------------------------|-------------------------------------------------------------------|--------------------------|
| Aguero-Torres (2001)                              | Yes                              | Yes                                                      | No                      | No                                    | Yes                                      | Yes                                      | Yes                                      | No                                                                 | 4                        |
| Andersen-Ranberg (2001)                           | Yes                              | Yes                                                      | Yes                     | Yes                                   | Yes                                      | Yes                                      | Yes                                      | No                                                                 | 6                        |
| Andreasen (1999)                                  | Yes                              | Yes                                                      | Yes                     | Yes                                   | Yes                                      | Yes                                      | Yes                                      | Yes                                                                 | 8                        |
| Anttila (2002)                                    | Yes                              | Yes                                                      | Yes                     | Yes                                   | NC                                       | Yes                                      | Yes                                      | Yes                                                                 | 7                        |
| Anttila (2004)                                    | Yes                              | Yes                                                      | Yes                     | NR                                    | NR                                       | Yes                                      | Yes                                      | No                                                                 | 5                        |
| Arai (2004)                                       | Yes                              | Yes                                                      | Yes                     | NC                                    | NR                                       | Yes                                      | Yes                                      | No                                                                 | 5                        |
| Arslantas (2009)                                  | Yes                              | Yes                                                      | NC                      | No                                    | NC                                       | Yes                                      | Yes                                      | Yes                                                                 | 5                        |
| Banerjee (2008)                                   | Yes                              | Yes                                                      | NR                      | NR                                    | NC                                       | Yes                                      | Yes                                      | Yes                                                                 | 5                        |
| Benedetti (2002)                                  | Yes                              | Yes                                                      | Yes                     | Yes                                   | Yes                                      | Yes                                      | Yes                                      | Yes                                                                 | 7                        |
| Benito-Leon (2009)                                | Yes                              | Yes                                                      | Yes                     | No                                    | NR                                       | Yes                                      | Yes                                      | No                                                                 | 5                        |
| Bennett (2003)                                    | Yes                              | Yes                                                      | NR                      | NR                                    | Yes                                      | Yes                                      | Yes                                      | No                                                                 | 4                        |
| Bermejo-Pareja (2008)                             | Yes                              | Yes                                                      | Yes                     | Yes                                   | NC                                       | Yes                                      | Yes                                      | Yes                                                                 | 7                        |
| Bermejo-Pareja (2009)                             | Yes                              | Yes                                                      | Yes                     | Yes                                   | NC                                       | Yes                                      | Yes                                      | Yes                                                                 | 7                        |
| Borjesson-Hanson (2004)                           | Yes                              | Yes                                                      | Yes                     | No                                    | No                                       | Yes                                      | Yes                                      | Yes                                                                 | 5                        |
| Borrini (2011)                                    | Yes                              | Yes                                                      | NR                      | NR                                    | NC                                       | Yes                                      | Yes                                      | Yes                                                                 | 5                        |
| Bottino (2008)                                    | Yes                              | No                                                       | No                      | No                                    | NC                                       | Yes                                      | Yes                                      | Yes                                                                 | 4                        |
| Camicioli (2000)                                  | Yes                              | Yes                                                      | Yes                     | Yes                                   | NC                                       | Yes                                      | Yes                                      | Yes                                                                 | 6                        |
| Canadian Study of Health and Aging Working Group (1994) | Yes                              | Yes                                                      | Yes                     | Yes                                   | NR                                       | Yes                                      | Yes                                      | Yes                                                                 | 6                        |
| Canadian Study of Health and Aging Working Group (2000) | Yes                              | Yes                                                      | Yes                     | Yes                                   | NC                                       | Yes                                      | Yes                                      | Yes                                                                 | 7                        |
| Chen (2007)                                       | Yes                              | Yes                                                      | Yes                     | Yes                                   | No                                       | Yes                                      | Yes                                      | Yes                                                                 | 7                        |
| Chien (2008)                                      | Yes                              | Yes                                                      | NA                      | NA                                    | NR                                       | Yes                                      | Yes                                      | Yes                                                                 | 5                        |
| Cornelius (2004)                                  | Yes                              | NC                                                       | NR                      | NR                                    | Yes                                      | Yes                                      | Yes                                      | Yes                                                                 | 4                        |
| Corrada (2008)                                    | Yes                              | Yes                                                      | NR                      | No                                    | Yes                                      | Yes                                      | Yes                                      | Yes                                                                 | 6                        |
| Corrada (2010)                                    | Yes                              | Yes                                                      | NR                      | No                                    | Yes                                      | Yes                                      | Yes                                      | Yes                                                                 | 6                        |
| Cristina (2001)                                   | Yes                              | Yes                                                      | No                      | Yes                                   | Yes                                      | Yes                                      | Yes                                      | Yes                                                                 | 7                        |
| Dahl (2007)                                       | Yes                              | Yes                                                      | NR                      | NR                                    | Yes                                      | Yes                                      | Yes                                      | Yes                                                                 | 5                        |
| Das (2006)                                        | Yes                              | Yes                                                      | Yes                     | Yes                                   | Yes                                      | Yes                                      | Yes                                      | Yes                                                                 | 8                        |
| Das (2008)                                        | Yes                              | Yes                                                      | Yes                     | Yes                                   | Yes                                      | Yes                                      | Yes                                      | Yes                                                                 | 8                        |
| Name                        | Year   | Scope of Use | Sampling Method | Statistical Analysis | Conclusion of Specificity | Conclusion of Sensitivity | Conclusion of Positive Predictive Value | Conclusion of Negative Predictive Value | Conclusion of Accuracy | Separability | Table Score |
|-----------------------------|--------|--------------|-----------------|-----------------------|----------------------------|----------------------------|-----------------------------------------|-----------------------------------------|------------------------|-------------|-------------|
| de Jesus Llibre (2009)      | Yes    | Yes          | No              | NR                    | Yes                        | Yes                        | Yes                                     | No                                      | Yes                    | No          | 6           |
| de Ronchi (2005)            | Yes    | Yes          | No              | Yes                   | No                         | Yes                        | Yes                                     | No                                      | Yes                    | No          | 6           |
| de Silva (2003)             | Yes    | Yes          | NR              | NR                    | NR                         | Yes                        | Yes                                     | Yes                                     | Yes                    | No          | 5           |
| Demirovic (2003)            | Yes    | Yes          | No              | Yes                   | No                         | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 6           |
| Di Carlo (2000)             | Yes    | Yes          | Yes             | Yes                   | Yes                        | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 7           |
| Di Carlo (2002)             | Yes    | Yes          | No              | Yes                   | No                         | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 6           |
| Elbly (1994)                | Yes    | Yes          | Yes             | NR                    | NR                         | Yes                        | Yes                                     | Yes                                     | Yes                    | No          | 5           |
| Edland (2002)               | Yes    | Yes          | Yes             | Yes                   | No                         | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 8           |
| Feldman (2006)              | Yes    | Yes          | NR              | NR                    | Yes                        | Yes                        | Yes                                     | No                                      | Yes                    | No          | 5           |
| Fish (2008)                 | Yes    | Yes          | Yes             | NR                    | NR                         | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 6           |
| Fitzpatrick (2004)          | Yes    | Yes          | Yes             | Yes                   | No                         | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 8           |
| Forti (2010)                | Yes    | Yes          | Yes             | No                    | No                         | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 7           |
| Fuhrer (2003)               | Yes    | Yes          | No              | Yes                   | No                         | Yes                        | Yes                                     | No                                      | Yes                    | Yes         | 6           |
| Fujishima (2002)            | No     | NC           | Yes             | NR                    | NR                         | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 4           |
| Galasko (2007)              | Yes    | Yes          | Yes             | Yes                   | No                         | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 7           |
| Ganguli (2000)              | Yes    | Yes          | NR              | NR                    | NR                         | Yes                        | Yes                                     | Yes                                     | Yes                    | No          | 5           |
| Ganguli (2000)              | Yes    | Yes          | NR              | NR                    | NR                         | Yes                        | Yes                                     | Yes                                     | Yes                    | No          | 5           |
| Garre-Olmo (2010)           | Yes    | Yes          | NA              | NA                    | Yes                        | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 6           |
| Gascon-Bayarri (2007)       | Yes    | Yes          | Yes             | Yes                   | Yes                        | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 8           |
| Gavrila (2009)              | Yes    | Yes          | Yes             | Yes                   | Yes                        | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 8           |
| Gislason (2003)             | Yes    | Yes          | No              | No                    | No                         | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 5           |
| Gourie-Devi (2004)          | Yes    | Yes          | NR              | NR                    | NR                         | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 5           |
| Graham (1997)               | Yes    | Yes          | NR              | NR                    | NR                         | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 5           |
| Guerchet (2010)             | Yes    | Yes          | Yes             | Yes                   | Yes                        | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 8           |
| Gureje (2006)               | Yes    | Yes          | Yes             | Yes                   | Yes                        | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 6           |
| Gurvit (2008)               | Yes    | Yes          | Yes             | Yes                   | Yes                        | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 8           |
| Hall (2009)                 | Yes    | Yes          | No              | Yes                   | NC                         | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 6           |
| Harvey (2003)               | Yes    | Yes          | NA              | No                    | NC                         | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 5           |
| Helmer (2006)               | Yes    | Yes          | Yes             | Yes                   | Yes                        | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 7           |
| Hendrie (2001)              | Yes    | Yes          | NR              | NR                    | Yes                        | Yes                        | Yes                                     | Yes                                     | Yes                    | No          | 7           |
| Herrera (2002)              | Yes    | Yes          | Yes             | Yes                   | Yes                        | Yes                        | Yes                                     | Yes                                     | Yes                    | No          | 6           |
| Ikeda (2001)                | Yes    | Yes          | Yes             | Yes                   | Yes                        | Yes                        | Yes                                     | Yes                                     | Yes                    | No          | 7           |
| Ikeda (2004)                | Yes    | Yes          | Yes             | Yes                   | Yes                        | Yes                        | Yes                                     | Yes                                     | Yes                    | No          | 6           |
| Ikemoto (2009)              | Yes    | Yes          | NR              | NR                    | NC                         | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 5           |
| Jacob (2007)                | Yes    | Yes          | Yes             | No                    | No                         | Yes                        | Yes                                     | Yes                                     | Yes                    | Yes         | 4           |
| Jhoo (2008)                 | Yes    | Yes          | No              | Yes                   | No                         | Yes                        | Yes                                     | Yes                                     | Yes                    | No          | 6           |
| Study (Year) | Q1: Target population described? | Q2: Cases from entire population or probability sampling? | Q3: Response rate >70%? | Q4: Non-responders clearly described? | Q5: Sample representative of population? | Q6: Data collection methods standardized? | Q7: Validated criteria to assess disease? | Q8: Were estimates given with confidence intervals or subgroups? | Total Quality Score (/8) |
|-------------|---------------------------------|------------------------------------------------|-----------------------|---------------------------------------|----------------------------------------|------------------------------------------|-------------------------------------|---------------------------------------------|-------------------|
| Jitapunkul (2001) | Yes | Yes | Yes | No | NR | Yes | No | Yes | 5 |
| Jitapunkul (2009) | Yes | NC | NR | Yes | No | Yes | Yes | Yes | 5 |
| Juva (2000) | No | Yes | Yes | No | NR | Yes | Yes | Yes | 5 |
| Kahana (2003) | Yes | Yes | Yes | NC | NC | Yes | Yes | Yes | 6 |
| Kawas (2000) | Yes | NC | NR | NR | No | Yes | Yes | Yes | 4 |
| Kim (2003) | Yes | Yes | No | No | NC | Yes | Yes | Yes | 5 |
| Kivipelto (2001) | Yes | Yes | Yes | No | NR | Yes | Yes | Yes | 5 |
| Kivipelto (2002) | Yes | Yes | Yes | No | NR | Yes | Yes | Yes | 5 |
| Knopman (2002) | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 6 |
| Knopman (2002) | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 6 |
| Knopman (2003) | Yes | Yes | Yes | Yes | NC | Yes | Yes | Yes | 7 |
| Knopman (2004) | No | NC | Yes | Yes | Yes | Yes | Yes | Yes | 6 |
| Kuul (2002) | Yes | Yes | No | No | NR | Yes | Yes | Yes | 6 |
| Kuller (2005) | No | Yes | NR | NR | NC | Yes | Yes | Yes | 4 |
| Landi (2005) | Yes | Yes | Yes | No | NR | Yes | No | Yes | 5 |
| Langa (2005) | Yes | Yes | No | No | NR | Yes | Yes | No | 5 |
| Larrieu (2004) | Yes | Yes | No | No | NR | Yes | Yes | Yes | 6 |
| Lee (2002) | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | 7 |
| Li (2007) | Yes | No | No | No | Yes | Yes | Yes | Yes | 5 |
| Li (2007) | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | 7 |
| Livingston (2001) | Yes | Yes | Yes | Yes | No | No | No | No | 4 |
| Llibre Rodriguez (2008) | Yes | Yes | Yes | No | NR | Yes | Yes | Yes | 6 |
| Llibre-Rodriguez (2008) | Yes | Yes | Yes | NR | Yes | Yes | Yes | Yes | 7 |
| Lopez (2003) | Yes | NR | NR | NR | NR | Yes | Yes | Yes | 4 |
| Lopez (2005) | Yes | Yes | NR | NR | NR | Yes | Yes | No | 4 |
| Lopez-Pousa (2004) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | 8 |
| Lovheim (2008) | Yes | Yes | Yes | Yes | No | Yes | No | Yes | 6 |
| Luck (2008) | Yes | NR | Yes | Yes | Yes | Yes | Yes | Yes | 6 |
| Magaziner (2000) | Yes | Yes | Yes | NR | Yes | Yes | Yes | Yes | 7 |
| Maneno (2006) | Yes | No | Yes | Yes | NR | No | No | No | 4 |
| Manton (2005) | Yes | Yes | NA | NR | NA | NR | No | Yes | 3 |
| Martens (2007) | Yes | Yes | NA | NA | NA | NC | Yes | Yes | 4 |
| Study            | FT   | FP   | SMM | RC  | Acc | BCP | ICP | NCP |
|------------------|------|------|-----|-----|-----|-----|-----|-----|
| Mathuranath (2010) | Yes  | Yes  | NA  | NA  | NC  | Yes | Yes | Yes |
| Matsui (2009)     | Yes  | Yes  | Yes | No  | NC  | Yes | Yes | No  |
| Matthews (2002)   | Yes  | Yes  | Yes | NR  | NC  | Yes | Yes | Yes |
| Matthews (2005)   | Yes  | Yes  | Yes | Yes | No  | Yes | Yes | Yes |
| McDowell (2007)   | Yes  | Yes  | NR  | NR  | NR  | Yes | Yes | No  |
| Meguro (2002)     | Yes  | Yes  | No  | No  | NR  | NR  | Yes | Yes |
| Meguro (2007)     | Yes  | Yes  | Yes | No  | Yes | Yes | Yes | Yes |
| Mehlig (2008)     | No   | Yes  | Yes | No  | NR  | Yes | Yes | Yes |
| Mercy (2008)      | Yes  | Yes  | Yes | Yes | No  | Yes | Yes | Yes |
| Miech (2002)      | Yes  | Yes  | Yes | Yes | Yes | Yes | Yes | Yes |
| Molero (2007)     | Yes  | Yes  | Yes | No  | Yes | Yes | No  | Yes |
| Nabalamba (2010)  | Yes  | Yes  | Yes | No  | Yes | Yes | No  | Yes |
| Ng (2010)         | Yes  | Yes  | Yes | No  | NR  | Yes | Yes | Yes |
| Nitrini (2004)    | Yes  | Yes  | Yes | NR  | Yes | Yes | Yes | Yes |
| Nunes (2010)      | Yes  | Yes  | No  | No  | NR  | Yes | Yes | Yes |
| Perkins (2002)    | Yes  | Yes  | NR  | NR  | Yes | Yes | Yes | Yes |
| Phung (2010)      | Yes  | Yes  | Yes | Yes | Yes | Yes | Yes | Yes |
| Piguet (2003)     | Yes  | Yes  | Yes | No  | NC  | Yes | Yes | No  |
| Plassman (2007)   | Yes  | Yes  | No  | Yes | Yes | Yes | Yes | Yes |
| Polvikoski (2001) | Yes  | Yes  | Yes | No  | Yes | Yes | Yes | Yes |
| Polvikoski (2006) | Yes  | Yes  | Yes | No  | Yes | Yes | Yes | No  |
| Prince (2008)     | Yes  | Yes  | Yes | No  | NR  | Yes | Yes | Yes |
| Rahkonen (2003)   | Yes  | Yes  | Yes | Yes | No  | Yes | Yes | Yes |
| Ravaglia (2005)   | Yes  | Yes  | Yes | Yes | No  | Yes | Yes | Yes |
| Ravaglia (2005)   | Yes  | Yes  | Yes | Yes | No  | Yes | Yes | Yes |
| Ravaglia (2006)   | Yes  | Yes  | Yes | Yes | No  | Yes | Yes | Yes |
| Riedel-Heller (2000) | Yes | Yes | Yes | Yes | No | Yes | Yes | No |
| Riedel-Heller (2001) | Yes | Yes | Yes | Yes | NR | Yes | Yes | Yes |
| Riedel-Heller (2001) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Rockwood (2000)   | No   | Yes  | No  | No  | NR  | Yes | Yes | Yes |
| Rosenblatt (2004) | Yes  | Yes  | Yes | No  | NR  | Yes | Yes | No  |
| Rovio (2005)      | Yes  | Yes  | Yes | Yes | No  | Yes | Yes | No  |
| Ruiterberg (2001) | Yes  | Yes  | Yes | No  | NR  | Yes | Yes | Yes |
| Sahadevan (2008)  | Yes  | Yes  | No  | Yes | No  | Yes | Yes | Yes |
| Samieri (2008)    | Yes  | NC   | Yes | No  | NR  | Yes | Yes | Yes |
| Sanderson (2003)  | Yes  | Yes  | NA  | NA  | NA  | NC  | No  | No  |
| Study (Year) | Q1: Target population described? | Q2: Cases from entire population or probability sampling? | Q3: Response rate >70%? | Q4: Non-responders clearly described? | Q5: Sample representative of population? | Q6: Data collection methods standardized? | Q7: Validated criteria to assess disease? | Q8: Were estimates given with confidence intervals or subgroups? | Total Quality Score (/8) |
|-------------|---------------------------------|--------------------------------------------------------|-------------------------|----------------------------------------|------------------------------------------|------------------------------------------|-------------------------------|------------------------------------------------------------------|------------------------|
| Scazufca (2008) | Yes                             | Yes                                                    | Yes                     | Yes                                    | Yes                                      | Yes                                      | Yes                           | Yes                                                                             | 8                      |
| Sekita (2010)    | Yes                             | Yes                                                    | NC                      | No                                     | Yes                                      | Yes                                      | Yes                           | Yes                                                                             | 5                      |
| Senarong (2001)  | Yes                             | NC                                                     | NR                      | NR                                     | Yes                                      | Yes                                      | Yes                           | No                                                                              | 3                      |
| Senarong (2001)  | Yes                             | NC                                                     | NR                      | NR                                     | Yes                                      | No                                       | Yes                           | Yes                                                                             | 3                      |
| Seshadi (2002)   | Yes                             | Yes                                                    | Yes                     | No                                     | Yes                                      | Yes                                      | Yes                           | Yes                                                                             | 6                      |
| Shaji (2005)     | Yes                             | Yes                                                    | Yes                     | Yes                                    | Yes                                      | Yes                                      | Yes                           | Yes                                                                             | 8                      |
| Silver (2001)    | Yes                             | Yes                                                    | Yes                     | No                                     | Yes                                      | Yes                                      | Yes                           | No                                                                              | 7                      |
| Simons (2006)    | Yes                             | Yes                                                    | Yes                     | NR                                     | Yes                                      | Yes                                      | Yes                           | Yes                                                                             | 7                      |
| Sousa (2009)     | Yes                             | Yes                                                    | Yes                     | No                                     | NC                                       | NC                                       | Yes                           | Yes                                                                             | 5                      |
| Spada (2009)     | Yes                             | Yes                                                    | No                      | NR                                     | Yes                                      | Yes                                      | Yes                           | No                                                                              | 5                      |
| Stevens (2002)   | Yes                             | Yes                                                    | Yes                     | NR                                     | Yes                                      | Yes                                      | Yes                           | Yes                                                                             | 7                      |
| Suh (2002)       | Yes                             | Yes                                                    | Yes                     | Yes                                    | Yes                                      | Yes                                      | Yes                           | Yes                                                                             | 8                      |
| Tyas (2006)      | No                              | Yes                                                    | No                      | Yes                                    | NC                                       | Yes                                      | Yes                           | Yes                                                                             | 5                      |
| van Excel (2002) | Yes                             | Yes                                                    | Yes                     | Yes                                    | Yes                                      | No                                       | Yes                           | No                                                                              | 5                      |
| Vas (2001)       | Yes                             | Yes                                                    | Yes                     | No                                     | Yes                                      | Yes                                      | Yes                           | Yes                                                                             | 7                      |
| Vermeer (2003)   | Yes                             | Yes                                                    | Yes                     | No                                     | Yes                                      | Yes                                      | Yes                           | Yes                                                                             | 7                      |
| von Heidken (2006)| Yes                             | Yes                                                    | Yes                     | Yes                                    | No                                       | Yes                                      | No                            | Yes                                                                             | 6                      |
| Wada-Isoe (2009) | Yes                             | Yes                                                    | NR                      | No                                     | Yes                                      | Yes                                      | Yes                           | Yes                                                                             | 6                      |
| Waite (2001)     | Yes                             | Yes                                                    | Yes                     | Yes                                    | Yes                                      | Yes                                      | Yes                           | Yes                                                                             | 8                      |
| Wakutani (2007)  | Yes                             | Yes                                                    | Yes                     | No                                     | NR                                       | Yes                                      | Yes                           | Yes                                                                             | 6                      |
| Wancata (2007)   | No                              | NC                                                     | No                      | Yes                                    | No                                       | Yes                                      | Yes                           | No                                                                              | 3                      |
| Wangtongkum (2008)| Yes                             | Yes                                                    | NR                      | No                                     | Yes                                      | Yes                                      | Yes                           | No                                                                              | 4                      |
| Wertman (2007)   | Yes                             | Yes                                                    | No                      | Yes                                    | Yes                                      | Yes                                      | Yes                           | Yes                                                                             | 7                      |
| Xu (2009)        | Yes                             | Yes                                                    | Yes                     | No                                     | NR                                       | Yes                                      | Yes                           | Yes                                                                             | 5                      |
| Yamada (2001)    | No                              | Yes                                                    | NR                      | No                                     | NR                                       | Yes                                      | Yes                           | Yes                                                                             | 5                      |
| Zhao (2010)      | Yes                             | Yes                                                    | Yes                     | No                                     | No                                       | Yes                                      | Yes                           | Yes                                                                             | 6                      |
| Zhou (2006)      | Yes                             | Yes                                                    | Yes                     | No                                     | NR                                       | Yes                                      | Yes                           | Yes                                                                             | 7                      |
| Zuliani (2010)   | Yes                             | Yes                                                    | Yes                     | No                                     | Yes                                      | No                                       | Yes                           | No                                                                              | 6                      |

*Note: NR= Not reported; NC= Not clear
as well as subgroup analyses by age, sex, setting, diagnostic criteria, study location (e.g., continent) and year of data collection. While, as expected, the incidence and prevalence of dementia rose with increasing age, no significant differences in the pooled estimates between men and women were found. There was a non-significant trend for community-only settings to have a lower prevalence than combined community plus institution studies, while the prevalence estimate was significantly higher in institution-only settings. Other than for incidence proportion, there were no significant differences between studies using the DSM–III–R and DSM–IV diagnostic criteria. North American pooled period prevalence and incidence proportion estimates were the highest, while those from Asia were lowest. Estimates of prevalence and incidence did not change over time. Unfortunately, we were not able to show the decline found in some recent studies. This could have a significant impact on the future burden of this condition. As noted earlier, with societal aging it is anticipated that the number of people with dementia worldwide will double by 2030 and triple by 2050. A decline in prevalence as seen in the CFAS would lower estimates of future costs for dealing with dementia in the United States by approximately 40%. The present study updates the body of literature on the epidemiology of dementia. Compared to other systematic reviews, a broader perspective was generally taken. For example, a recent systematic review on the prevalence of dementia was restricted to persons diagnosed only with DSM–IV and ICD–10 criteria and did not assess heterogeneity by any factor other than geographic region, or focused only on China or Asia and/or did not perform a systematic review or meta-analysis. Erkinjuntti and colleagues examined the effect of different diagnostic criteria on the prevalence of dementia in a large population-based cohort and found widely varying estimates (e.g., 3.1% using the ICD–10 classification system versus 29.1% with DSM–III criteria). More modest differences were found when DSM–III–R and DSM–IV criteria were compared (17.3 and 13.7%, respectively). In this report, we had a limited ability to explore the influence of diagnostic criteria but found evidence that DSM–III–R and DSM–IV criteria produced similar results, other than for incidence proportion. Prior research has suggested that there might be significant regional differences in the prevalence and incidence of dementia. Unfortunately, there are major limitations in the available data, such as a lack of nationally representative studies in a number of large countries, few reports from some regions of the world (e.g., Sub-Saharan Africa), and the marked heterogeneity seen between countries within a geographic region (i.e., studies carried out in one or two countries cannot be safely generalized to all nations within a specific region). Study quality did not vary by continent in the present analyses. The lowest estimates of period prevalence obtained from Asia are consistent with other recent systematic reviews where the incidence and/or prevalence of other neurodegenerative conditions (i.e., Parkinson’s and Huntington’s disease) have been reported to be lower in Asia. A number of factors could account for these differences, including population genetics, exposure to environmental risk factors, differing life expectancy, and variations in case ascertainment due to the amount of stigma associated with certain conditions resulted in underreporting. The strength of the conclusions that can be drawn from this study is limited by a number of factors. First, the quality of the included studies was variable and at times less than desired (e.g., no reporting of response rates or nonresponder characteristics). Second, significant heterogeneity was present among all estimates of prevalence and incidence. This was likely driven by the differing populations studied and methods used. There was evidence of publication bias for the incidence proportion and period prevalence of dementia, suggesting that there may be unpublished studies reporting differing results. Finally, some studies did not provide the specific data (e.g., proportion with CI95%, numerator and denominator, etc.) necessary to include them in the meta-analyses. To improve the comparability of studies and comprehensiveness of future meta-analyses in this area, an effort should be made to standardize study procedures and reporting.

In conclusion, dementia is a common neurological condition in older individuals. Significant gaps in knowledge about its epidemiology were identified. For example, there are few studies examining the incidence of dementia in low- and middle-income countries, where the disruptive impact of an aging population may be greatest in view of limited resources. Future research should also focus on assessing the impact of utilizing DSM–5 diagnostic criteria for major neurocognitive disorders on estimates, examining differences in rates among subgroups within a larger study population, where appropriate, and further assessing dementia in a variety of settings and geographic regions.

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DISCLOSURES

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STATEMENT OF AUTHORSHIP

KMF, NJ, JIR, CJM, TP and DBH contributed to study conception and design. KMF, NJ, JIR, CJM, EES, SEB, LB, AC, LD, JH, AK, DP, AV and DBH contributed to the acquisition of data. KMF conducted the data analysis. KMF, NJ, JIR, CJM, EES and DBH participated in the interpretation of study data. All authors participated in critically revising the manuscript for important intellectual content

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and gave final approval for the submission of this manuscript and any further submissions of this work.

**Supplementary Material**

To view the supplementary material that exist for this study (Appendix A and B), please visit http://dx.doi.org/10.1017/cjn.2016.18.

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