

## **Supplementary material**

This document provides supplementary material for the manuscript: Trends in incidence of total or type 2 diabetes: a systematic review.

The information in the document is intended to provide additional detail for data extraction and analyses.

## **Search Strategy**

We searched MEDLINE, EMBASE and CINAHL from 1 January 1980 until 31 December 2017 without language restrictions. We conducted two searches and combined the results (Table 1). In the first search, we used the following medical subject heading (MeSH) terms: Diabetes Mellitus, Type 2/ep [Epidemiology], Diabetes Mellitus, Type 2/ or Diabetes Mellitus/, Glucose Intolerance/ep [Epidemiology], Diabetes Mellitus/ep [Epidemiology] AND Incidenc/, "inciden".m\_titl. For the second search, we used the following MeSH terms: Diabetes Mellitus, Type 2/ep [Epidemiology], Diabetes Mellitus, Type 2/ or Diabetes Mellitus/, Glucose Intolerance/ep [Epidemiology], Diabetes Mellitus/ep [Epidemiology] AND follow up studies/, cohort studies/, longitudinal studies/, and prospective studies. We also 'hand' searched reference lists of the identified reports to identify eligible articles.

**Table 1: Details of the Search Strategy**

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Database: Ovid MEDLINE(R) 1946 to Present with Daily Update  
Search Strategy:1980-2017

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1	Diabetes Mellitus, Type 2/ep [Epidemiology]
2	Diabetes Mellitus/ep [Epidemiology]
3	Glucose Intolerance/ep [Epidemiology]
4	Diabetes Mellitus, Type 2/ or Diabetes Mellitus/
5	"inciden*".m_titl.
6	Incidence/
7	5 or 6
8	Follow-up studies/
9	Cohort studies/
10	Prospective studies/
11	Longitudinal studies/
12	1 or 2 or 3 or 4
13	8 or 9 or 10 or 11
14	7 and 12
15	12 and 13
16	14 or 15
17	Pragmatic Clinical Trial/ or Clinical Trial, Phase III/ or Randomized Controlled Trial/ or Trial.mp. or Clinical Trial, Phase II/ or "Trial of Labor"/ or Clinical Trial, Phase I/ or Clinical Trial, Phase IV/ or Clinical Trial/ or Controlled Clinical Trial.mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]
18	16 not 17
19	animals/
20	18 not 19
21	Letter/
22	20 not 21
23	limit 22 to yr="1980 – end of 2017"

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**Table 2. Format of incidence data and types of subgroups reported**

Author, Year	Data presented				Subgroups reported		
	Country	Crude	Adjusted/ Standardised	Age group	Sex	Diabetes type	Ethnicity
Oster, 2011 <sup>12</sup>	Canada	No	Yes	No	No	Both	Yes
Dyck, 2010 <sup>16</sup>	Canada	No	Yes	No	Yes	Both	Yes
CCDSS, 2017 <sup>19</sup>	Canada	Yes	No	Yes	Yes	Both	No
Blanchard, 1996 <sup>20</sup>	Canada	Yes	Yes	Yes	Yes	Total	No
Green, 2003 <sup>21</sup>	Canada	Yes	Yes	No	No	Both	Yes
Alangh, 2013 <sup>22</sup>	Canada	No	Yes	No	No	Total	Yes
Horn, 2007 <sup>24</sup>	Canada	Yes	Yes	Yes	Yes	Type 2	No
Lipscombe, 2007 <sup>23</sup>	Canada	Yes	Yes	Yes	Yes	Total	No
Liu, 2007 <sup>25</sup>	China	Yes	No	No	No	Type 2	No
Carstensen, 2008 <sup>26</sup>	Denmark	Yes	Yes	No	Yes	Total	No
Green, 2015 <sup>27</sup>	Denmark	Yes	Yes	No	Yes	Total	No
Abouzeid, 2015 <sup>28</sup>	Finland	Yes	No	No	Yes	Type 2	No
Laakso, 1991 <sup>29</sup>	Finland	No	Yes	No	Yes	Total	No
Michaeli, 1993 <sup>30</sup>	Germany	Yes	No	No	No	Both	No
Boehme, 2015 <sup>31</sup>	Germany	No	Yes	Yes	Yes	Type 2	No
Quan, 2017 <sup>32</sup>	Hong Kong	No	Yes	No	Yes	Total	No
Vilbergsson, 1997 <sup>33</sup>	Iceland	No	Yes	No	Yes	Type 2	No
Karpati, 2014 <sup>34</sup>	Israel	Yes	Yes	Yes	No	Both	No
Monesi, 2011 <sup>35</sup>	Italy	Yes	Yes	Yes	Yes	Both	No
Song, 2016 <sup>36</sup>	Korea	Yes	No	No	Yes	Total	No
Soderberg, 2004 <sup>15</sup>	Mauritius	Yes	Yes	Yes	Yes	Type 2	Yes
Dowse, 1991 <sup>37</sup>	Nauru	Yes	Yes	No	No	Type 2	No
Ruwaard, 1996 <sup>38</sup>	Netherlands	No	Yes	Yes	Yes	Total	No
Strom, 2014 <sup>39</sup>	Norway	Yes	No	No	Yes	Total	No
De Sousa-Uva, 2016 <sup>11</sup>	Portugal	No	Yes	Yes	Yes	Both	No
Evans, 2007 <sup>40</sup>	Scotland	Yes	No	No	No	Type 2	No
Read, 2016 <sup>41</sup>	Scotland	No	Yes	No	Yes	Type 2	No
Ringborg, 2008 <sup>45</sup>	Sweden	Yes	Yes	Yes	No	Type 2	No
Berger, 1999 <sup>42</sup>	Sweden	Yes	No	No	No	Total	No
Jansson, 2015 <sup>43</sup>	Sweden	No	Yes	Yes	Yes	Both	No
Jansson, 2007 <sup>44</sup>	Sweden	Yes	Yes	Yes	Yes	Both	No
Huber, 2014 <sup>46</sup>	Switzerland	Yes	Yes	Yes	Yes	Total	No
Lin, 2013 <sup>47</sup>	Taiwan	Yes	Yes	Yes	Yes	Type 2	No
Tseng, 2006 <sup>48</sup>	Taiwan	Yes	No	Yes	Yes	Type 2	No
Holden, 2013 <sup>49</sup>	UK	Yes	Yes	Yes	Yes	Type 2	No
Zghebi, 2017 <sup>50</sup>	UK	No	Yes	Yes	Yes	Type 2	No
Abraham, 2015 <sup>7</sup>	US	Yes	Yes	No	No	Total	No

<b>Author, Year</b>	<b>Country</b>	<b>Crude</b>	<b>Adjusted/ Standardised</b>	<b>Age group</b>	<b>Sex</b>	<b>Diabetes type</b>	<b>Ethnicity</b>
Akushevich, 2013 <sup>51</sup>	US	No	Yes	No	No	Total	No
Burke, 2002 <sup>52</sup>	US	Yes	Yes	Yes	Yes	Total	No
CDC, 2008 <sup>53</sup>	US	Yes	Yes	No	No	Total	No
Geiss, 2014 <sup>6</sup>	US	No	Yes	Yes	Yes	Both	Yes
McBean, 2004 <sup>54</sup>	US	No	Yes	Yes	Yes	Both	Yes
Nichols, 2015 <sup>56</sup>	US	Yes	Yes	Yes	Yes	Total	Yes
Tabaei, 2012 <sup>57</sup>	US	Yes	Yes	No	No	Both	No
Weng, 2016 <sup>9</sup>	US	Yes	No	Yes	Yes	Type 2	No
Narayanan, 2010 <sup>55</sup>	US, Alaska	No	Yes	No	No	Total	Yes
Pavkov, 2007 <sup>58</sup>	US Pima Indians	No	Yes	Yes	No	Type 2	No

Notes: CCDSS- Canadian Chronic Disease Surveillance System, CDC- Centers for Disease Control and Prevention.

**Table 3: Annual percentage change across time-periods among studies without counts and denominator data.**

Author, year		Country	Annual present change (%) in incidence, p value				
			1970–1979	1980–1989	1990–1999	2000–2005	2006–2014
Oster et al 2011 <sup>12</sup> , Indigenous population	T	Canada				1.1, <0.001	
Oster et al 2011 <sup>12</sup> , General population	T	Canada				4.6, <0.001	
Green et al 2015 <sup>27</sup>	M	Denmark			Not estimated	2.5, <0.01	2.5, <0.001
Green et al 2015 <sup>27</sup>	F	Denmark			Not estimated	2.3, <0.001	2.3, <0.001
Laakso et al 1991 <sup>29</sup>	M	Finland	1.5, 0.20	3.2, <0.001			
Laakso et al 1991 <sup>29</sup>	F	Finland	2.1, 0.79	3.0, <0.001			
Monesi et al 2011 <sup>35</sup>	T	Italy				-1.1 0.20	
Evans et al 2007 <sup>40</sup>	T	Scotland			5.8, <0.001	5.60, 0.004	
Holden et al 2013 <sup>49</sup>	M	UK			11.8, <0.001	5.0, 0.63	8.1, <0.001
Holden et al 2013 <sup>49</sup>	F	UK			13.2, <0.001	-4.5, 0.21	8.5, <0.001
Akushevich et al 2013 <sup>51</sup>	T	US			-1.1, 0.49	2.30, 0.16	

Notes: Analyses completed using Joinpoint, assuming constant variance.

## **Quality score**

This scale below includes items that assess representativeness of the study population, sample size at each time period, whether the outcome of interest was present or not at the baseline of the study, the method of assessing outcomes, adequacy of follow-up, whether the incidence rate was adjusted/standardized, and number of data points reported. The maximum score was 13 and final scores were defined as low quality (score 0 – 4), medium (score 5 –7), or high quality (score 8 – 13).

## **Modified Newcastle-Ottawa Quality Assessment Scale for trends in incidence of diabetes**

A study can be awarded a maximum of one, two or three points for each numbered item within each category.

### **Selection**

1. Representativeness of the general population (sampling frame).
  - a) National population based (2 points) eg: national insurance or administrative data or national registry
  - b) Non-national population based (1 point) eg: regional, population-based surveys
  - c) Selected group e.g. patient group; employees; insured population, in a country without universal insurance or no description (0 points)
2. Sample size at each time period
  - a) >10,000 (1 point)
  - b) ≤10,000 (0 points)
3. Indication in the paper that outcome of interest (diabetes) was not present at start of study (at baseline)
  - a) Yes (1 point)
  - b) No (0 points)

### **Outcome**

1. Assessment of outcome.
  - a) Screening of total adult population for undiagnosed diabetes (FPG, OGTT, HbA1c) (4 points)
  - b) Administrative algorithm where at least two criteria are used (3 points)
  - c) Record linkage (Clinical diagnosis) or ICD code (2 points)

- d) Self-report (1 point)
  - e) No description (0 points)
2. Data capture and adequacy of follow up of cohorts/surveys.
- a) Insurance/electronic databases (2 points)
  - b) Medical records (2 points)
  - c) Cohort/survey follow up >80% (2 points)
  - d) Cohort/survey follow up 60 – 80% (1 point)
  - e) Cohort/survey follow up <60% or no statement (0 points)

**Comparability**

1. Is the incidence rate adjusted/standardized for at least age?
- a) Yes (1 point)
  - b) No (0 points)

**Completeness of trend data**

1. How many time periods are reported?
- a)  $\geq 10$  (2 points)
  - b) 5 – 9 (1 point)
  - c) <5 (0 points)

**Maximum score= 13 which can be obtained**

**Table 4: Quality assessment of the included studies**

Author, Year	Country	Representativeness	Sample size at time periods	Presence of outcome at baseline	Outcome assessment	Follow-up adequacy	Comparability (adjusted/standardised)	Completeness (no. of data points)	Total Score
Range		<b>0–2</b>	<b>0–1</b>	<b>0–1</b>	<b>0–4</b>	<b>0–2</b>	<b>0–1</b>	<b>0–2</b>	<b>13</b>
Oster, 2011 <sup>12</sup>	Canada	2	1	1	3	2	1	2	12
Dyck, 2010 <sup>16</sup>	Canada	2	1	1	3	2	1	2	12
CCDSS, 2017 <sup>19</sup>	Canada	2	1	1	3	2	0	2	11
Blanchard, 1996 <sup>20</sup>	Canada	2	1	0	3	2	1	1	10
Green, 2003 <sup>21</sup>	Canada	1	1	1	2	2	1	2	10
Alangh, 2013 <sup>22</sup>	Canada	2	1	1	2	2	1	0	9
Lipscombe, 2007 <sup>23</sup>	Canada	2	1	0	3	2	1	1	10
Horn, 2007 <sup>24</sup>	Canada	1	0	1	3	2	1	1	9
Liu, 2007 <sup>25</sup>	China	2	1	0	2	2	0	1	8
Carstensen, 2008 <sup>26</sup>	Denmark	2	1	1	3	2	1	2	12
Green, 2015 <sup>27</sup>	Denmark	2	1	1	3	2	1	2	12
Abouzeid, 2015 <sup>28</sup>	Finland	1	1	1	1	1	0	0	5
Laakso, 1991 <sup>29</sup>	Finland	1	1	1	2	2	1	2	10
Michaelis, 1993 <sup>30</sup>	Germany	2	1	1	2	2	0	1	9
Boehme, 2015 <sup>31</sup>	Germany	1	1	1	3	2	1	0	9
Quan, 2017 <sup>32</sup>	Hong Kong	2	1	1	3	2	1	1	11
Vilbergsson, 1997 <sup>33</sup>	Iceland	1	0	1	4	1	1	0	8
Karpati, 2014 <sup>34</sup>	Israel	2	1	1	3	2	1	1	11
Monesi, 2011 <sup>35</sup>	Italy	2	1	1	2	2	1	1	11
Song, 2016 <sup>36</sup>	Korea	2	1	0	2	2	0	1	8
Soderberg, 2004 <sup>15</sup>	Mauritius	1	0	1	4	1	1	0	8
Dowse, 1991 <sup>37</sup>	Nauru	2	0	1	4	2	1	0	10
Strom, 2014 <sup>39</sup>	Norway	2	1	0	1	2	0	1	7



Author, Year	Country	Representativeness	Sample size at time periods	Presence of outcome at baseline	Outcome assessment	Follow-up adequacy	Comparability (adjusted/standardised)	Completeness (no. of data points)	Total Score
deSouza_Uva, 2016 <sup>11</sup>	Portugal	1	1	0	2	2	1	1	8
Evans, 2007 <sup>40</sup>	Scotland	2	1	1	3	2	0	2	11
Read, 2016 <sup>41</sup>	Scotland	2	1	1	3	2	1	2	12
Berger, 1999 <sup>42</sup>	Sweden	2	1	1	2	2	0	1	9
Jansson, 2015 <sup>43</sup>	Sweden	2	1	1	2	2	1	1	10
Jansson, 2007 <sup>44</sup>	Sweden	2	0	1	2	2	1	2	10
Ringborg, 2008 <sup>45</sup>	Sweden	1	1	1	3	2	1	1	10
Huber, 2014 <sup>46</sup>	Switzerland	2	1	1	2	2	1	0	9
Lin, 2013 <sup>47</sup>	Taiwan	2	1	1	3	2	1	1	11
Tseng, 2006 <sup>48</sup>	Taiwan	2	1	0	2	2	0	1	8
Ruwaard, 1996 <sup>38</sup>	The Netherlands	1	1	0	2	2	1	0	7
Holden, 2013 <sup>49</sup>	UK	2	1	1	3	2	1	2	12
Zghebi, 2017 <sup>50</sup>	UK	2	1	1	3	2	1	2	12
Abraham, 2015 <sup>7</sup>	US	1	0	1	4	0	1	0	7
Akushevich, 2013 <sup>51</sup>	US	2	1	1	2	2	1	0	9
Burke, 2002 <sup>52</sup>	US	1	1	1	3	2	1	1	10
CDC, 2008 <sup>53</sup>	US	1	1	1	1	1	1	0	6
Geiss, 2014 <sup>6</sup>	Us	2	1	1	1	2	1	2	10
McBean, 2004 <sup>54</sup>	US	2	1	1	3	2	1	1	11
Nichols, 2015 <sup>56</sup>	US	1	1	1	3	2	1	1	10
Tabaei, 2012 <sup>57</sup>	US	2	1	1	1	1	1	0	7
Weng, 2016 <sup>9</sup>	US	2	1	1	3	2	0	0	9
Narayanan, 2010 <sup>55</sup>	US, Alaska	2	1	0	3	2	1	0	9
Pavkov, 2007 <sup>58</sup>	US, Pimas	2	0	1	4	1	1	0	9

**Figure 1: Incidence of diabetes over time for those aged a) <40 years, b) 40 – 54 years, c) 55 –60 years, among incidence studies reporting age-specific data.**

