Beyond the List:
Refining your PubMed searches with interactive visualizations

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The future of medical education.

Yeoh KG.
PMID: 30840994

Fetal Sheep and Ventilated Preterm Lambs.

PMID: 30840951

Progress in the discovery of naturally occurring anti-diabetic drugs and in the identification of their molecular targets.

He JH, Chen LX, Li H.
PMID: 30840917

Similar articles
Lists

Pro
• Simple
• Great for providing access

Con
• Are only ordered on one axis
• Don’t show context

Can we do better?
“The fundamental task in data analysis is to make smart comparisons. We are always trying to ask the question, ‘Compared with what?’”

-- Edward Tufte
Design Principles: Fast, Cheap and Out of Control

• Use existing libraries whenever possible
• Push as much out to the browser as possible
• Working code will work just fine...

https://xkcd.com/1513/
Fun with JavaScript!

- Runs in the browser
  - Many browsers have built-in “developer” tools
- Lots of self-study materials available online
- Readily extendable using external libraries and frameworks
Google Charts

• Relatively simple
• Free!
• Can use with static tables of data or interactive data that you grab on the fly

https://developers.google.com/chart/
Basic Pattern

1. Send search to PubMed
2. Retrieve counts
3. Compare them to a baseline of some kind
4. Graph the difference
5. ???
6. Profit
APIs

Network Topology

Data Flow

Kbrose -- Wikimedia
APIs


```json
{
  "header": {
    "type": "esearch",
    "version": "0.3"
  },
  "esearchresult": {
    "count": "20648",
    "retmax": "0",
    "retstart": "0",
    "querykey": "1",
    "webenv": "NCID_1_65988278_130.14.22.33_9001_1551995173_1918872135_0MetA0_S_MegaStore",
    "idlist": [...]
  }
}
```
E-Utilities

- API to NCBI databases
- Maintained by NLM
- Simple syntax for calls – easy to implement in many environments


Ed Sperr

I am a librarian who mucks around with code...

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https://esperm.github.io/
Can we group citations by subject?

Stefanidis I1, Triastoudi M2, Tzironi EE3, Dardotia E4, Tachmizis Sy5, Potiados A6, Pissias G1, Kotoulias K1, Soudacki M1, Arnaudis G1, Marias PR3, Liakopoulou V7, Erotofyllis T8, Hadjiigianni GI9, Samka M2, Zintzaras E2.

Abstract

An association study was conducted to investigate the relation between 14 variants of glucose transporter 1 gene (SLC2A1) and the risk of type 2 diabetes (T2DM) to nephropathy. We also performed a meta-analysis of 11 studies investigating association between diabetic nephropathy (DN) and SLC2A1 variants. The cohort included 197 cases (T2DM with nephropathy), 155 diseased controls (T2DM without nephropathy) and 246 healthy controls. The association of variants with disease progression was tested using generalized odds ratio (OR2). The risk of type 2 diabetes leading to nephropathy was estimated by the OR of additive and co-dominant models. The mode of inheritance was assessed using the degree of dominance index (h-Index). We synthesized results of 11 studies examining association between 5 SLC2A1 variants and DN. OR2 was used to assess the association between variants and DN using random effects models. Significant results were derived for co-dominant model of rs12407920 [OR = 2.01 (1.17-3.45)], rs841847 [OR = 1.73 (1.12-2.66)] and rs841853 [OR = 1.74 (1.18-2.65)] and for additive model of rs3729548 [OR = 0.52 (0.29-0.90)]. The mode of inheritance for rs12407920 and rs841853 was 'dominance of each minor allele' and for rs3729548 'non-dominance'. Frequency of one haplotype (C-G-G-A-T-C-T-G-T-C-A-G) differed significantly between cases and healthy controls [p = .014]. Regarding meta-analysis, rs841853 contributed to an increased risk of DN ([OR2 = 1.43 (1.09-1.88)], OR2 = 1.58 (1.01-2.48)] between diseased controls versus cases and healthy controls versus cases, respectively. Further studies confirm the association of rs12407920, rs841847, rs841853, as well as rs3729548 and the risk of T2DM leading to
Diabetes Mellitus, Type 2

A subclass of DIABETES MELLITUS that is not INSULIN-responsive or dependent (NIDDM). It is characterized initially by INSULIN RESISTANCE and HYPERINSULINEMIA; and eventually by GLUCOSE INTOLERANCE; HYPERGLYCEMIA; and overt diabetes. Type II diabetes mellitus is no longer considered a disease exclusively found in adults. Patients seldom develop KETOSIS but often exhibit OBESITY.


PubMed search builder options

Subheadings:
- analysis
- anatomy and histology
- blood
- cerebrospinal fluid
- chemically induced
- classification
- complications
- congenital
- diagnosis
- diagnostic imaging
- diet therapy
- drug therapy
- economics
- embryology
- enzymology
- epidemiology
- ethnology
- etiology
- genetics
- history
- immunology
- metabolism
- microbiology
- mortality
- nursing
- organization and administration
- parasitology
- pathology
- physiology
- physiopathology
- prevention and control
- psychology
- radiotherapy
- rehabilitation
- statistics and numerical data
- surgery
- therapy
- transmission
- urology
- veterinary
- virology
Sperr – Beyond the List

See Also:
- Rats, Inbred OLETF
- Metabolic Syndrome

All MeSH Categories
- Disease Category
  - Nutritional and Metabolic Diseases
  - Metabolic Diseases
    - Glucose Metabolism Disorders
      - Diabetes Mellitus
    - Diabetes Mellitus, Type 2
      - Diabetes Mellitus, Lipomatophic

All MeSH Categories
- Disease Category
  - Endocrine System Diseases
    - Diabetes Mellitus
    - Diabetes Mellitus, Type 2
      - Diabetes Mellitus, Lipomatophic
MeSH Category Graph

About MeSH Category Graph

Enter your MEDLINE search above, and MeSH Category Graph will show how the concepts in your results stack up against the 16 top-level categories in the MeSH hierarchy. For each search you’ll see two graphs — one showing percentages compared to those for all of MEDLINE and another showing relative proportion. Once you have completed at least two searches, you can compare the proportions of one search against another. (more)
Proportion of results for "Heart Diseases[mesh]" in each category compared to baseline

- Analytical, Diagnostic and Therapeutic Techniques and Equipment
- Anatomy
- Anthropology, Education, Sociology and Social Phenomena
- Chemicals and Drugs
- Disciplines and Occupations
- Diseases
- Geographical Locations
- Health Care
- Humanities
- Information Science
- Organisms
- Persons
- Phenomena and Processes
- Psychiatry and Psychology
- Technology and Food and Beverages

Made with Mesh Category Graph: http://esperr.github.io/mesh-cat-graph/
MeSH Subheading Graph

About MeSH Subheading Graph

Diabetes Mellitus, Type 2

Enter your MEDLINE search above, and MeSH Subheading Graph will show how the concepts in your results stack up against the 23 top-level subheadings in the MeSH qualifier hierarchy. For each search you'll see two graphs — one showing percentages compared to those for all of MEDLINE and another showing relative proportions. Once you have completed at least two searches, you can compare the proportions of one search against another. (more)

Design and construction by Ed Sperr, M.L.I.S. (ed_sperr@hotmail.com) | Data from NCBI | Charting tools from
Proportion of subheadings for "Diabetes Mellitus, Type 2[mesh]" compared to baseline

Subheading:
- analysis
- anatomy and histology
- chemistry
- classification
- diagnosis
- drug effects
- education
- ethics
- etiology
- history
- injuries
- instrumentation
- methods
- organization and administration
- pathogenicity
- pharmacology
- physiology
- psychology
- radiation effects
- statistics and numerical data
- therapeutic use
- therapy
- veterinary

Made with Mesh Subheading Graph: http://esperr.github.io/mesh-subhead-graph/
Can we tell something about how the parts of a search are connected?
Figure 2. Venn diagrams for conjunction, disjunction, and complement

Watchduck -- Wikimedia
PubVenn enables you to explore PubMed using venn diagrams. Enter any multi-term search above to see the relative size of the citation set for each term as well as how those sets interact.

For example, you can try simple searches such as smoking AND cancer or slightly more complex ones such as mosquito AND dengue AND caribbean.

Note: You can now use parantheses to group terms together in a search -- for example, depression AND (euthanasia OR assisted suicide).

Use the "expanded subjects" option to see the myriad of terms that PubMed translates your search into before it gets run, as with cancer [expanded] or heart disease [expanded]. Please note that due to the number of terms a search can get mapped to, the sets for expanded subjects can take a few seconds to render.
love AND death
heart diseases[mesh] AND diabetes mellitus, type 2[MeSH]
Can we show trends for a search over time?
Diabetes Mellitus, Type 2[mesh]  

malaria  

surgery  

heart diseases[mesh]  

medical education
Proportion of citations in PubMed
proportion for each search by year, 1945 to 2018

Made with PubMed by Year: http://esperr.github.io/pubmed-by-year
Proportion of citations in PubMed
proportion for each search by year, 1945 to 2018

Made with PubMed by Year: http://esperr.github.io/pubmed-by-year
Is it useful to combine these techniques?
Search Workbench

Search Workbench lets you easily examine, edit and visualize your PubMed Searches. See how the parts of your search overlap and observe how it performs over time. Then compare your searches to another in order to zero-in on exactly the terms you want to use. (more)

Load previous session

Load local  Load from textfile
Search Workbench

Your search "Diabetes Mellitus, Type 2[Mesh]" found 120726 results.

Was translated to:

"diabetes mellitus, type 2"[Mesh Terms]

Add a nickname for this search:

Add

Venn diagram

Only one valid term entered.

Proportion by year

See more on PubMed by Year

Design and construction by Ed Sperr, M.L.I.S. | Data from NCBI | Visualization tools from Google and Ben Friedrickson | See the code at GitHub
Search results

1. In hospital, short-term and long-term adverse clinical outcomes observed in patients with type 2 diabetes mellitus vs non-diabetes mellitus following Percutaneous coronary intervention. A meta-analysis including 139,774 patients.
   - PubMed: 30813214
   - Full text

2. Metformin diminishes the unfavourable impact of HBOC in breast cancer patients with type 2 diabetes.
   - PubMed: 30903422
   - Similar articles

3. Diabetes and premature death.
   - PubMed: 30750472
   - Similar articles

4. Features of the clinics and treatment of patients with obesity and hypertension (according to the National register of arterial hypertension).
   - PubMed: 30701729
   - Similar articles

5. Machine Learning for the Prediction of New-Onset Diabetes Mellitus during 5-Year Follow-up in Non-Diabetic, Patients with Cardiovascular Risk.
   - PubMed: 30666461
   - Similar articles

[Essential hypertension, Definitions, hemodynamic, clinical and therapeutic review]
Questions?

https://esperr.github.io/visualizingpubmed/
https://searchworkbench.info/

https://github.com/esperr

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