

# Improving Discovery of medical journal articles



WIKIPEDIA



WIKIDATA

# Hello from team wiki!



Lane Rasberry  
Wikimedian in Residence  
Data Science Institute  
University of Virginia



Thanks to Alfred P. Sloan  
Foundation for support

# Agenda

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1. past and developing
2. developing and future
  - a. WikiCite
  - b. Scholia
  - c. machine learning

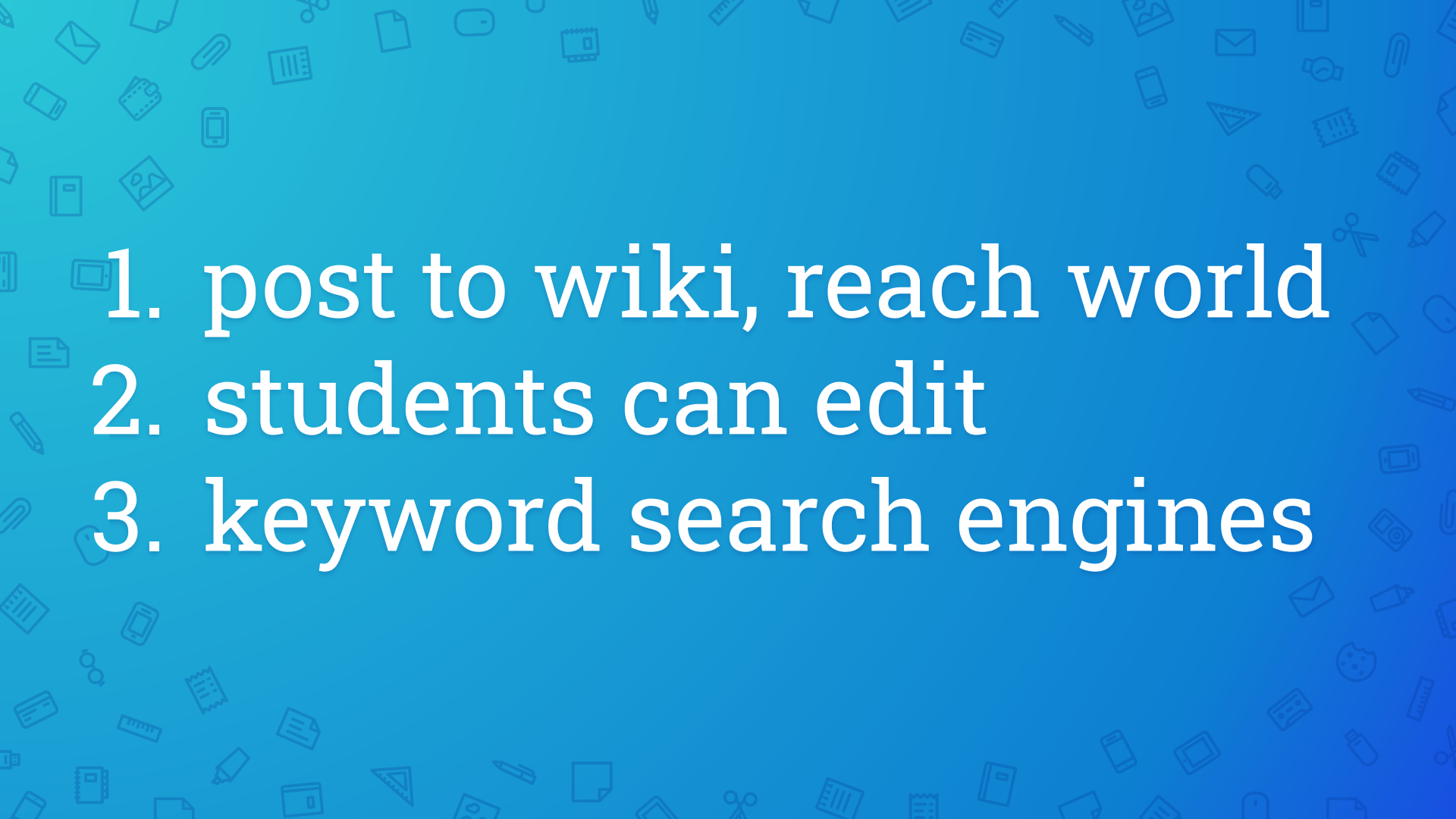
# Discovery

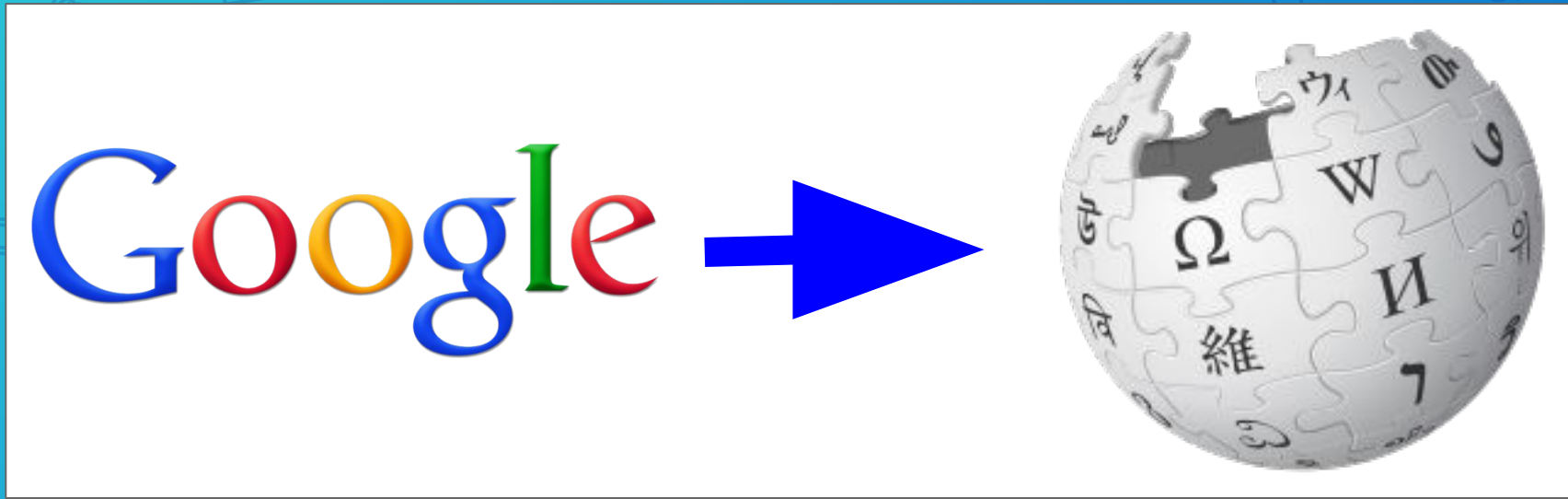
---

Finding desirable information

- by request
- by browsing
- by unsolicited suggestion

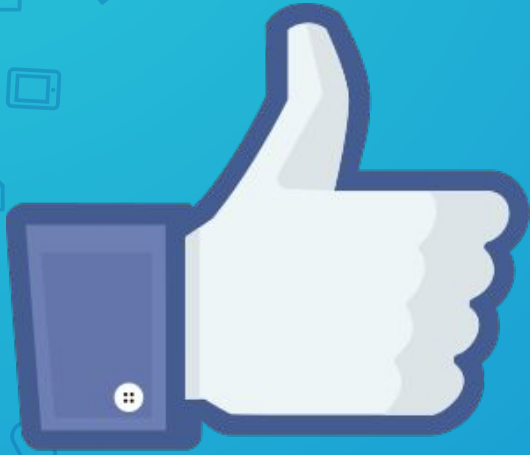


- 
1. post to wiki, reach world
  2. students can edit
  3. keyword search engines



Wiki popular source of  
medical information

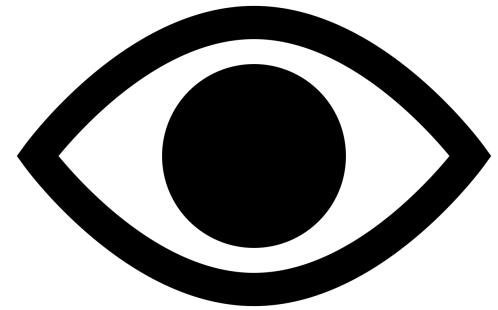
# Post content, get metrics



likes



tweets



Wiki views



# Students can edit

# TOURO COLLEGE

case study 2016-2018

Physical therapy  
students edit Wikipedia

JOURNAL OF MEDICAL INTERNET RESEARCH

Weiner et al

Original Paper

## Improving the Quality of Consumer Health Information on Wikipedia: Case Series

Shira Schecter Weiner<sup>1</sup>, PT, PhD; Jill Horbacewicz<sup>1</sup>, PT, PhD; Lane Rasberry<sup>2</sup>, BS; Yocheved Bensinger-Brody<sup>1\*</sup>, PT, PhD

<sup>1</sup>Department of Physical Therapy Program, School of Health Sciences, Touro College, New York, NY, United States

<sup>2</sup>Data Science Institute, University of Virginia, Charlottesville, VA, United States

\*all authors contributed equally

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### Abstract

**Background:** Wikipedia is one of the most consulted health resources in the world. Since the public is using health information from Wikipedia to make health care decisions, improving the quality of that health information is in the public interest. The open editable content design of Wikipedia and quality control processes in place provide an opportunity to add high-value, evidence-based information and take an active role in improving the health care information infrastructure.

**Objective:** The aim of this project was to enhance Wikipedia health pages using high-quality, current research findings and track the persistence of those edits and number of page views after the changes to assess the reach of this initiative.

**Methods:** We conducted Wikipedia Editions with 3 different cohorts of Physical Therapy (PT) students to add high-quality health information to existing Wikipedia pages. Students synthesized best evidence information and updated and/or corrected existing Wikipedia entries on specific health pages. To evaluate the impact of these contributions, we examined two factors: (1) response to our contributions from the Wikipedia editing community, including number and type of subsequent edits as well as persistence of the student contributions and (2) number of page views by the public from the time of the page edits.

**Results:** A total of 98 PT students in 3 different cohorts engaged in Editions, editing 24 health pages. Of the 24 edits, 22 persisted at the end of the observation period (from time of entry to May 31, 2018) and received nearly 8 million page views. Each health page had an average of 354.75 page views.

**Conclusions:** The Wikipedia Edition is an effective way to continuously enhance the quality of health information available on Wikipedia. It is also an excellent way of bridging health technology with best-evidence medical facts and disseminating accurate, useful information to the public.

*(J Med Internet Res 2019;21(3):e12450) doi:10.2196/12450*

### KEYWORDS

consumer health information; health literacy; Wikipedia; public health; physical therapy education

### Introduction

Wikipedia is one of the most, if not the most, consulted health resources in the world [1]. Therefore, improving the quality of its content ensures the dissemination of high-level information

to all who visit its pages. The open editable content design of Wikipedia and the quality control processes in place provide an opportunity to add high-value, evidence-based information and take an active role in improving the health care information infrastructure.

<https://www.jmir.org/2019/3/e12450/>

*J Med Internet Res 2019 | vol. 21 | iss. 3 | e12450 | p. 1*  
(page number not for citation purposes)

# Programs and Events Dashboard

physical therapy 2019

Home

Editors

Articles

Uploads

Activity

0

Articles Created

12

Articles Edited

91

Total Edits

28

Editors

7.9K

Words Added

84<sup>i</sup>

References Added

967K

Article Views

physical therapy 2019

Edit Description

[https://en.wikipedia.org/wiki/Wikipedia:Touro/Winter\\_2019](https://en.wikipedia.org/wiki/Wikipedia:Touro/Winter_2019)

Details

**Facilitators:** [Blueraspberry](#) (

**Institution:** Touro College

**Home Wiki:** en.wikipedia.or

**Tracked Wikis:** en.wikipedi

[www.wikidata.org](http://www.wikidata.org)

# Plain text search in research

## Talk:Diabetes

From Wikipedia, the free encyclopedia

 1,884 revisions since 2002-03-15 (+64 days), 446 editors, 869 watchers, 72 pageviews (30 days), created by: Redmist (64) · See full page statistics



*Skip to table of contents*



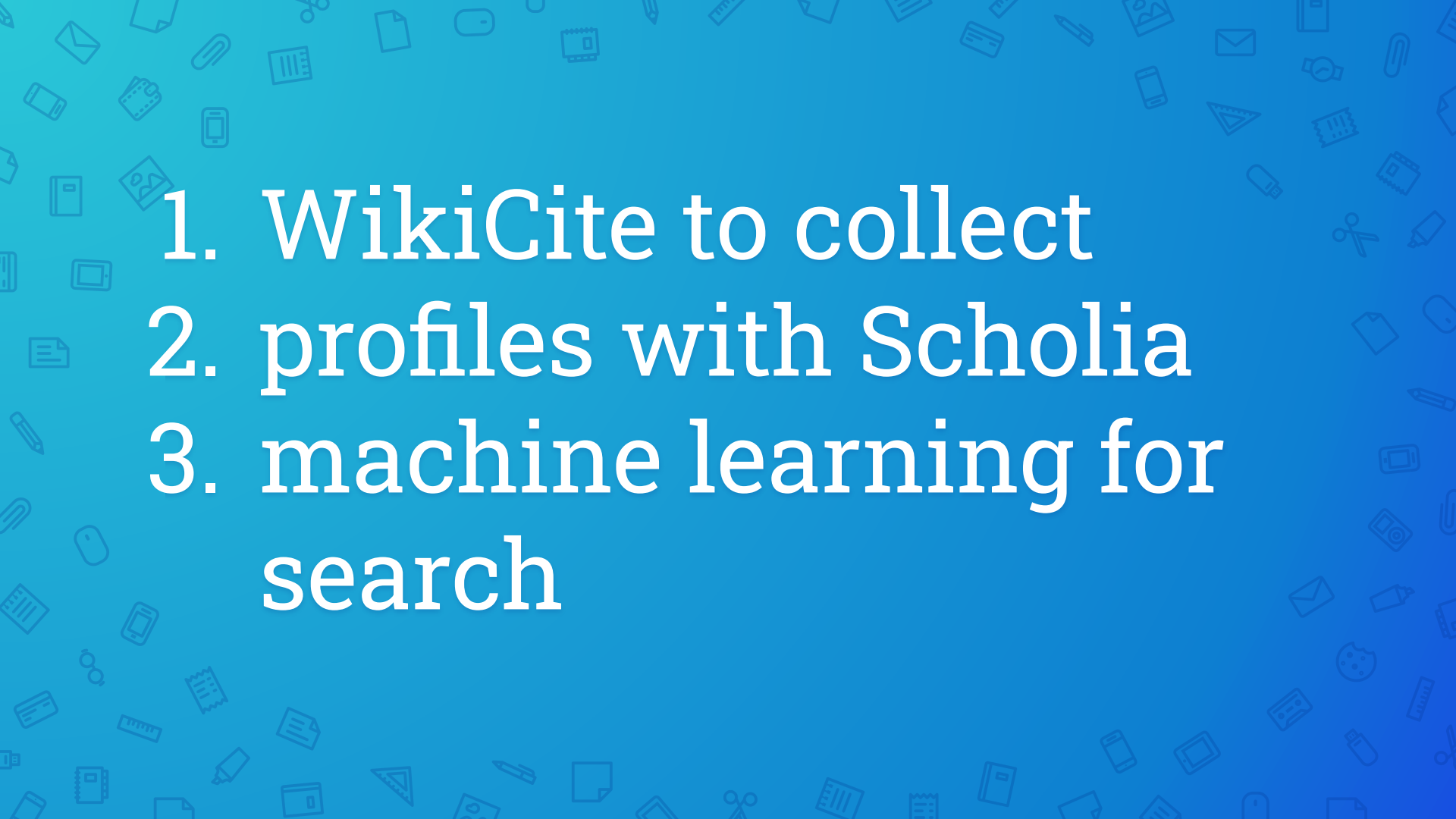
**Ideal sources** for Wikipedia's health content are defined in the guideline *Wikipedia:Identifying reliable sources (medicine)* and are typically *review articles*. Here are links to **possibly useful** sources of information about **Diabetes**.



- PubMed provides **review articles from the past five years** (limit to **free review articles**)
- The TRIP database provides **clinical publications about evidence-based medicine**.
- Other potential sources include: **Centre for Reviews and Dissemination** and **CDC**



Wikidata  
is changing  
everything

- 
1. WikiCite to collect
  2. profiles with Scholia
  3. machine learning for search

# Wikidata is medium data

---

Small data is...

- "things humans in a field discuss with colleagues"

Big data is...

- "things humans discuss with machines"

# Wikidata is medium data

"general reference data for humans"



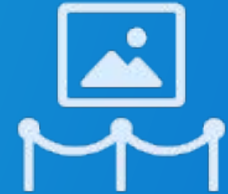
People



Articles



Organizations



Artwork

cross disciplinary, 1 billion readers

# Wikidata content

publications

miscellaneous

???

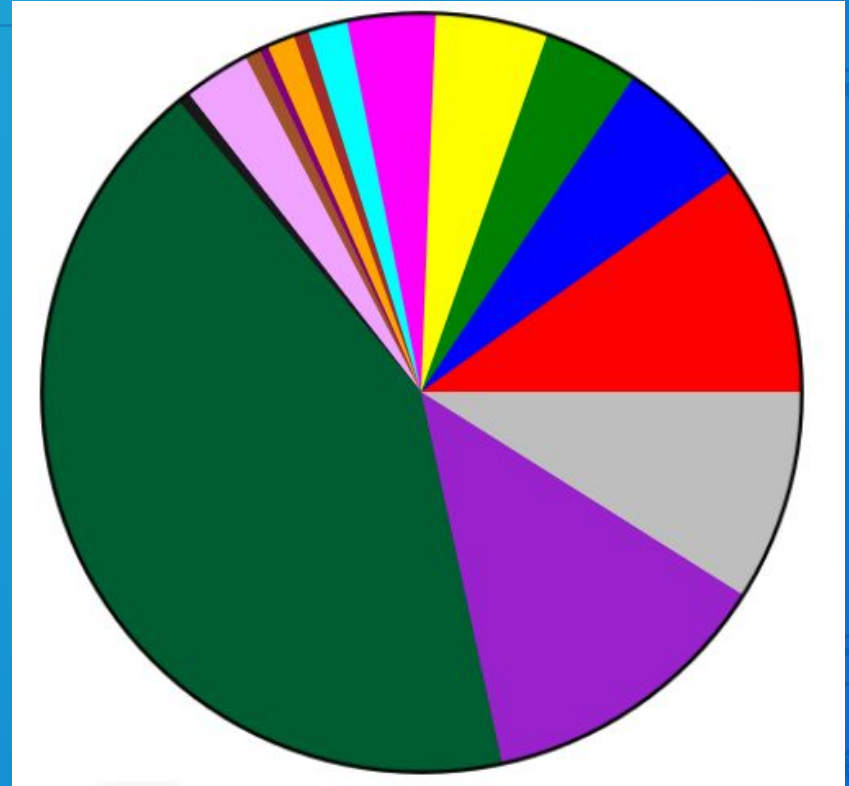
people

taxon

territory

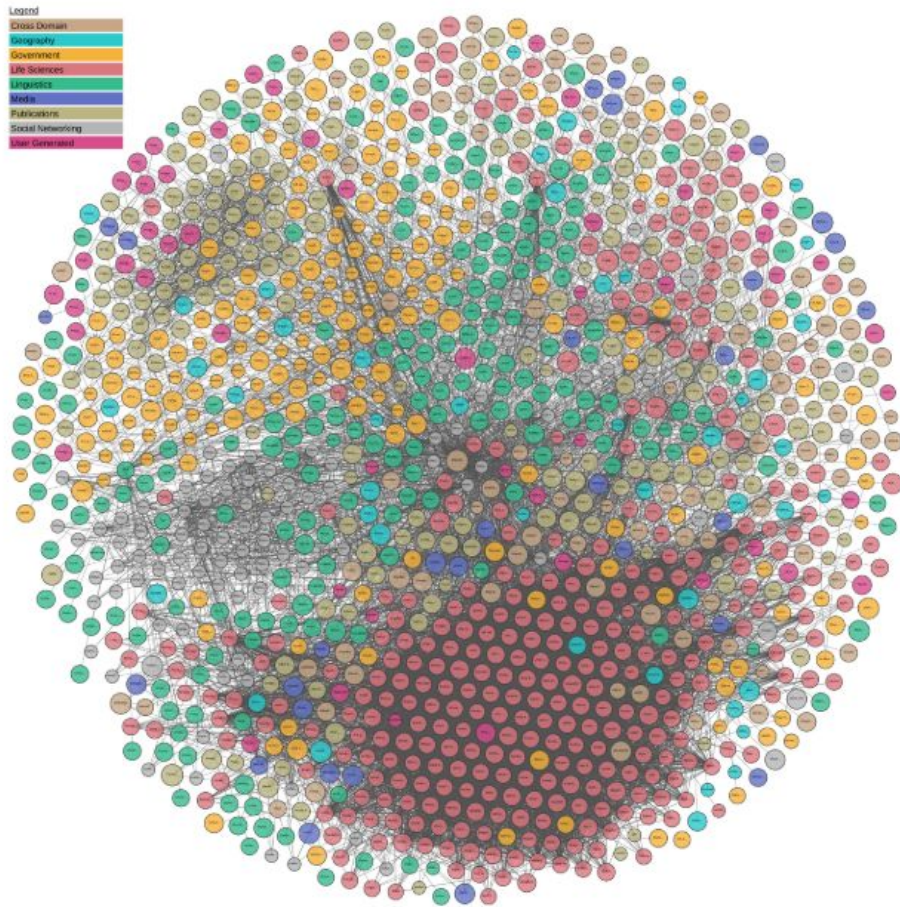
structure

event





We already  
mapped  
Wikidata to  
everything  
[lod-cloud.net](http://lod-cloud.net)



The Linked Open Data Cloud from lod-cloud.net



# Linked Open Data from wiki

A screenshot of a mobile application interface for the University of Virginia. The interface features the university's logo on the left, a map with a red location pin and the text 'University of Virginia' on the right, and a photograph of a building below the map. There are buttons for 'See photos' and 'See outside'. Below this is a section titled 'University of Virginia' with buttons for 'Website', 'Directions', and 'Save'. A description follows: 'Public university in Charlottesville, Virginia'. At the bottom, there is a paragraph of text about the university's history and a 'Wikipedia' link.

UNIVERSITY OF VIRGINIA

See photos

See outside

## University of Virginia

Website Directions Save

Public university in Charlottesville, Virginia

The University of Virginia is a public research university in Charlottesville, Virginia. The flagship university of Virginia, it is also a World Heritage site of the United States. It was founded in 1819 by Declaration of Independence author and former President Thomas Jefferson. [Wikipedia](#)

# Edit an item

Item

Donna Strickland (Q56855591)

employer



University of Waterloo

edit

start time

1997

▼ 3 references

property

value

# WikiCite content

---

- Most citations from PubMed
- MeSH tags
- Much of ClinicalTrials.gov
- content enrichment, e.g. author disambiguation, topic tagging

# WikiCite is its own project

---

1. 3 annual conferences
2. 500+ contributors
3. ~40% of Wikidata
4. debates like "Limits of Wikidata"

{ } wikicite





# List of papers on this topic

## Zika virus infection (Q27043680)

Related: psychosis · leishmaniasis · vacation · complications of diabetes mellitus · The Madonna in art · neurodegeneration · uveitis · amnesia · adenoma · entropy

### Recently published works on the topic

Show  entries

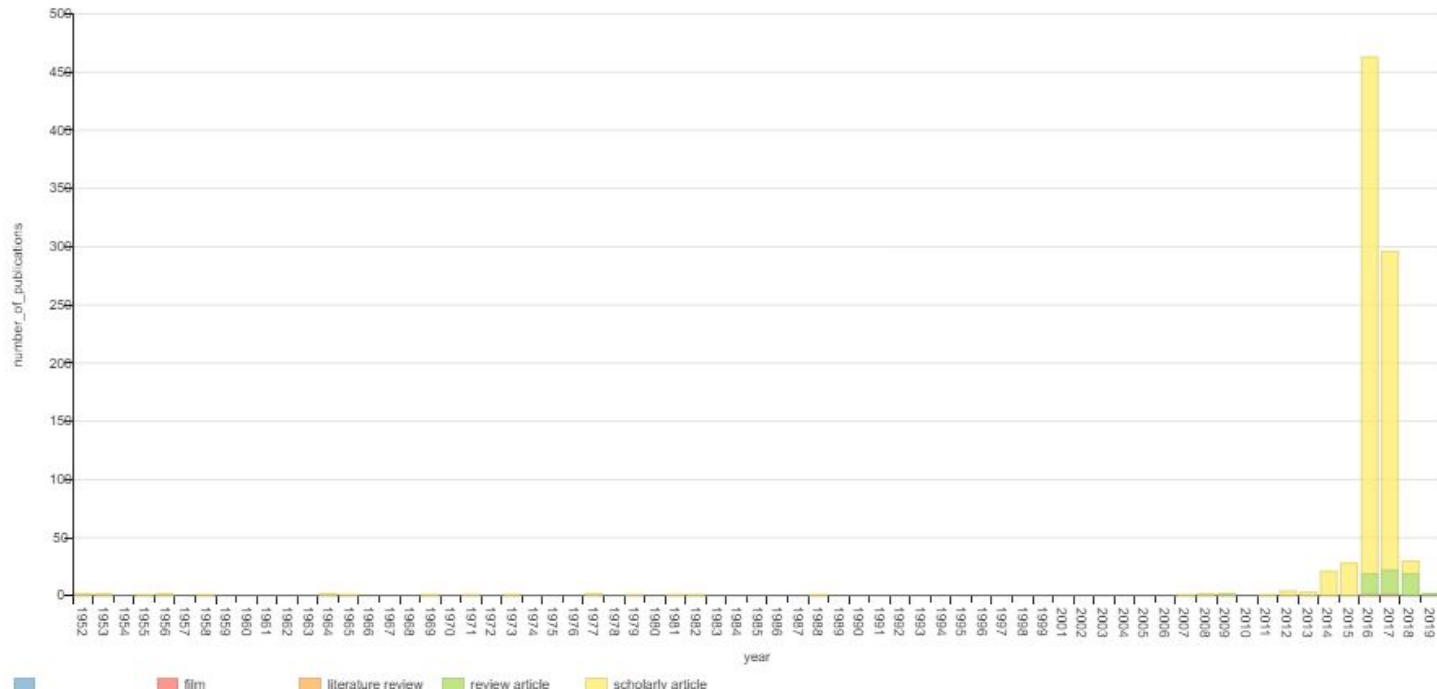
Search:

Date	Work	Topics
2019-01-28	<a href="#">Presence of the point mutations Val1016Gly in the voltage-gated sodium channel detected in a single mosquito from Panama</a>	dengue fever // chikungunya // Aedes aegypti // Zika fever // mosquito vectors
2019-01-06	<a href="#">A 'Furry-Tale' of Zika Virus Infection: What Have We Learned from Animal Models?</a>	Zika virus // Zika fever
2018-12-10	<a href="#">Cross-reactive dengue virus-derived monoclonal antibodies to Zika virus envelope protein: Panacea or Pandora's box?</a>	dengue fever // Zika virus // Dengue virus // Zika fever // infectious disease // viral envelope proteins
2018-12-01	<a href="#">Integrated Aedes management for the control of Aedes-borne diseases</a>	dengue fever // yellow fever // chikungunya // Zika fever // infectious disease // mosquito vectors
2018-11-15	<a href="#">Restriction of Zika virus infection and transmission in Aedes aegypti mediated by an insect-specific flavivirus</a>	immunology // parasitology // Zika virus // Aedes aegypti // drug discovery // Zika fever // infectious disease // Zika virus infection // Zika virus transmission // Nhumirim virus // insect-specific viruses
2018-11-14	<a href="#">Recent Advances in Zika Virus Vaccines</a>	Zika virus // Zika fever
2018-11-08	<a href="#">Hearing Screening in children with Congenital Zika Virus Syndrome in Fortaleza, Ceará, Brazil, 2016</a>	Zika virus // congenital Zika virus infection
2018-10-31	<a href="#">Reverse Genetic Approaches for the Generation of Recombinant Zika Virus</a>	Zika virus // Zika fever



# Papers by year

Publications per year



# Authors publishing on topic

## Authors

### Authors publishing about the topic

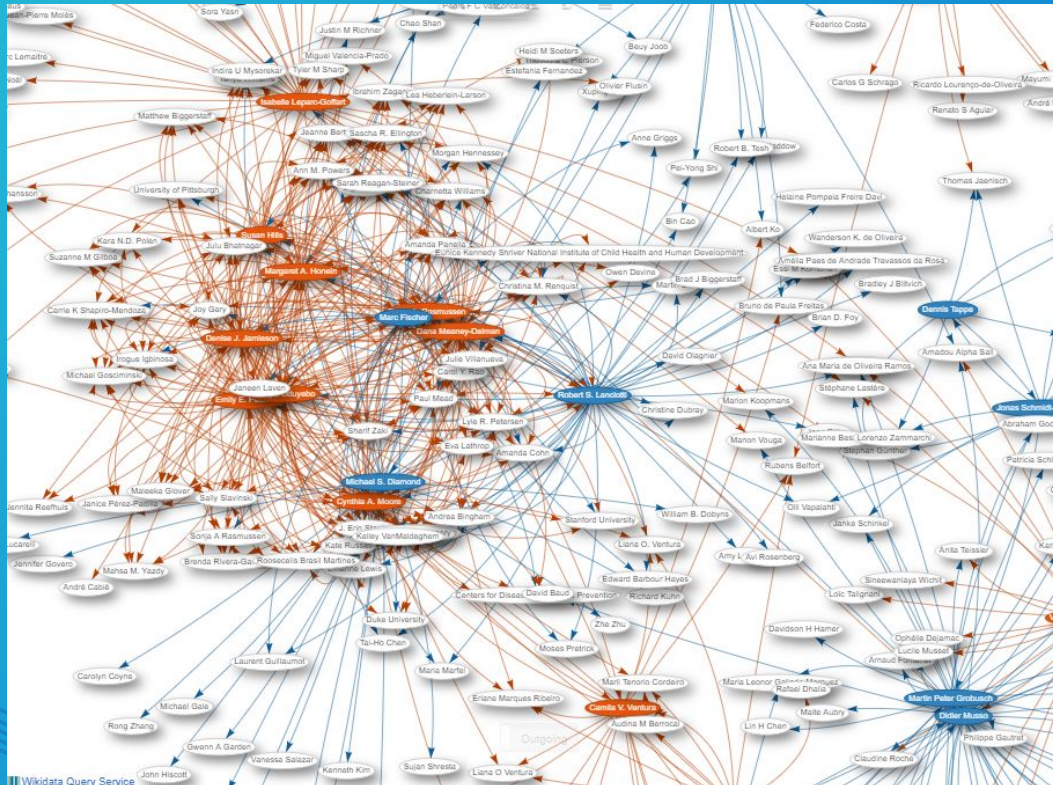
Show  entries

Search:

Count	Author	Orcid
30	Alfonso J. Rodríguez-Morales	0000-0001-9773-2192
29	Margaret A. Honein	<a href="https://orcid-search/quick-search/?searchQuery=Margaret A. Honein">orcid-search/quick-search/?searchQuery=Margaret A. Honein</a>
28	Denise J. Jamieson	<a href="https://orcid-search/quick-search/?searchQuery=Denise J. Jamieson">orcid-search/quick-search/?searchQuery=Denise J. Jamieson</a>
26	Dana Meaney-Delman	0000-0002-3005-2982
25	Viroj Wiwanitkit	0000-0003-1039-3728
25	Didier Musso	0000-0002-9226-0971
23	Jonas Schmidt-Chanasit	0000-0003-4433-0231
19	Titilope Oduyebo	<a href="https://orcid-search/quick-search/?searchQuery=Titilope Oduyebo">orcid-search/quick-search/?searchQuery=Titilope Oduyebo</a>
18	Michael S. Diamond	<a href="https://orcid-search/quick-search/?searchQuery=Michael S. Diamond">orcid-search/quick-search/?searchQuery=Michael S. Diamond</a>
18	Emily E. Petersen	<a href="https://orcid-search/quick-search/?searchQuery=Emily E. Petersen">orcid-search/quick-search/?searchQuery=Emily E. Petersen</a>

[Edit on query.Wikidata.org](#)

# Coauthor network



# Co-occurring topics

## Co-occurring topics

Show  entries

Count	Topic
1065	<a href="#">Zika virus</a>
447	<a href="#">congenital Zika virus infection</a>
338	<a href="#">Zika fever</a>
225	<a href="#">human pregnancy</a>
171	<a href="#">birth defect</a>
134	<a href="#">travel-associated Zika virus infection</a>
122	<a href="#">microcephaly</a>
121	<a href="#">travel-associated infection</a>
107	<a href="#">2015–16 Zika virus epidemic</a>
81	<a href="#">Chikungunya virus</a>

[Edit on query.Wikidata.org](#)

# Locations in papers



# Most cited papers

## Works cited from works on the topic

Show  entries

See

Count	Cited work
214	<a href="#">Zika Virus Outbreak on Yap Island, Federated States of Micronesia</a>
209	<a href="#">Zika virus. I. Isolations and serological specificity</a>
184	<a href="#">Genetic and serologic properties of Zika virus associated with an epidemic, Yap State, Micronesia, 2007</a>
171	<a href="#">Zika Virus Associated with Microcephaly</a>
126	<a href="#">Zika Virus and Birth Defects — Reviewing the Evidence for Causality</a>
116	<a href="#">Zika Virus Infection in Pregnant Women in Rio de Janeiro — Preliminary Report</a>
111	<a href="#">Probable non-vector-borne transmission of Zika virus, Colorado, USA</a>
101	<a href="#">Detection and sequencing of Zika virus from amniotic fluid of fetuses with microcephaly in Brazil: a case study</a>
98	<a href="#">Zika virus infection complicated by Guillain-Barre syndrome--case report, French Polynesia, December 2013</a>
95	<a href="#">Guillain-Barré Syndrome outbreak associated with Zika virus infection in French Polynesia: a case-control study</a>

Work count ↕	Topic ↕	Type of topic ↕	Superclass of topic ↕
639	high energy physics	branch of physics	
144	teenager	demographic profile	human
125	Higgs boson	type of quantum particle	scalar boson
112	radiation therapy	medical specialty	therapy treatment of cancer
107	endothelium	tissue	simple squamous epithelium
106	myocardial infarction	disease	coronary artery disease
102	arteriovenous malformation	disease	hemangioma vascular malformation
98	cell biology	branch of biology	biology
97	obesity	disease	overnutrition

# popular topics + U of Virginia

# black + U of Virginia

35		Julian Bond	American social activist	male
36		Sheila Jackson Lee	American politician	female
37		Ralph Sampson	American basketball player	male

women + school  
senator + school  
award + school  
astronaut + school  
whatever + school



# Match medical articles to Wikipedia

1. Cochrane is Wikipedia's favorite medical journal
2. Wikipedia articles should cite Cochrane papers
3. Match wiki medical articles to Cochrane papers

## Bi-directional Relevance Matching between Medical Corpora

Jingnan Yang, Justin Ward, Erfaneh Gharavi, Jennifer Dawson, Rafael Alvarado  
jy4fch@virginia.edu, jw8vsv@virginia.edu, eg8q@virginia.edu, JDawson@cochrane.org, ra2k@virginia.edu,

**Abstract** – Readily available, trustworthy, and usable medical information is vital to promoting global health. Cochrane is a non-profit medical organization that conducts and publishes systematic reviews of medical research findings. Over 3000 Cochrane Reviews are presently used as evidence in Wikipedia articles. Currently, Cochrane's researchers manually search Wikipedia pages related to medicine in order to identify Wikipedia articles that can be improved with Cochrane evidence. Our aim is to streamline this process by applying existing document similarity and information retrieval methods to automatically link Wikipedia articles and Cochrane Reviews. Potential challenges to this project include document length and the specificity of the corpora. These challenges distinguish this problem from ordinary document representation and retrieval problems. For our methodology, we worked with 4 from 7400 Cochrane Reviews, ranging from one several pages in length, and 33,000 Wikipedia articles categorized as medical. We explored different methods of document vectorization including TFIDF, LDA, L word2Vec, and doc2Vec. For every document in the corpora, their similarity to each document in the opposing set was calculated using established vector similarity metrics such as cosine similarity and J divergence. Labeled data for this unsupervised task not available. Models were evaluated by comparing results to two standards: (1) Cochrane Reviews currently cited in Wikipedia articles and (2) a data set provided a medical expert that indicates which Cochrane Review could be considered for specific Wikipedia articles. Our system performs best using TFIDF document representation and cosine similarity.

**Index Terms** – Document Similarity, Cochrane, Medical Document Analysis, Automated Citation Recommendation

### INTRODUCTION

Medical journals provide information that directly informs consumer health decisions. By having this information accessible, more people are able to learn and make use of information that is valuable for general health and well-being. One major drawback of this research area is that, due to the in-depth details covered and context specific language used, it can be a challenge for a person without background

expertise to gain practical insight from the literature. This is limiting to both the spread and general use of the research.

One approach to sharing information to a general audience is through online encyclopedias such as Wikipedia. Wikipedia is among the most popular sources of medical information [1]. Depending on the topic, Wikipedia's medical articles have the potential to be exposed to and consumed by millions of people from around the world. There are over 25,000 articles that pertain to human health on Wikipedia. Numerous medical experts volunteer to keep these articles up to date, however, ensuring that all evidence shared in these articles is accurate and unbiased can be a challenging task.

Cochrane is a non-profit medical organization that develops and disseminates systematic reviews of medical research studies and clinical trials so that healthcare



have developed a system to take any review or article and return the most similar documents from the opposing corpora. To accomplish this task, a variety of existing document similarity approaches used in machine learning and information retrieval problems were explored to identify the most effective methods for finding similarity between long,

<sup>1</sup> <https://www.ncbi.nlm.nih.gov/pubmed/>

# Medical Matching Machine, mmmapp.org

## Medical Matching Machine (MMM)

Search relevant Wikipedia articles with Cochrane reviews

Search relevant Cochrane reviews with Wikipedia articles

# Give Wikipedia article, get papers

## Diabetes mellitus

Cochrane Review	Similarity
Cinnamon for diabetes mellitus	0.72575915
Rosiglitazone for type 2 diabetes mellitus	0.68492204
Self-monitoring of blood glucose in patients with type 2 diabetes mellitus who are not using insulin	0.68161464
Pioglitazone for type 2 diabetes mellitus	0.6691993
Dipeptidyl peptidase-4 (DPP-4) inhibitors for type 2 diabetes mellitus	0.6455423
Exercise for pregnant women with pre-existing diabetes for improving maternal and fetal outcomes	0.6209863
Insulin and oral agents for managing cystic fibrosis-related diabetes	0.60826427
Alpha-glucosidase inhibitors for people with impaired glucose tolerance or impaired fasting blood glucose	0.60459244
Different insulin types and regimens for pregnant women with pre-existing diabetes	0.6002223
Continuous subcutaneous insulin infusion versus multiple daily injections of insulin for pregnant women with diabetes	0.58831173

# Give a paper, get a wiki article

## Combined diet and exercise interventions for preventing gestational diabetes mellitus

Wikipedia Article	Similarity
Randomized controlled trial	0.41220874
"Womens Health Initiative"	0.3831056
Exercise	0.32254803
Clinical trial	0.3224703
Exercise prescription	0.304645
Ketogenic diet	0.28775012
ClinicalTrials.gov	0.28611457
DASH diet	0.2854837
Analysis of clinical trials	0.27533603
Prenatal nutrition	0.27232492

# MeSH-style topic tagging

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- MeSH is human curated topic tagging for PubMed
- ~US\$10 per paper
- humans do it
- 30% of PubMed cataloged

# Topic tagging

For a paper, tag

- medical condition
- treatment
- region
- demographic

JOURNAL OF MEDICAL INTERNET RESEARCH

Weiner et al

Original Paper

## Improving the Quality of Consumer Health Information on Wikipedia: Case Series

Shira Schecter Weiner<sup>1</sup>, PT, PhD; Jill Horbacewicz<sup>1</sup>, PT, PhD; Lane Rasberry<sup>2</sup>, BS; Yocheved Bensingro-Brody<sup>1</sup>, PT, PhD

<sup>1</sup>Department of Physical Therapy Program, School of Health Science, Touros College, New York, NY, United States

<sup>2</sup>Data Science Institute, University of Virginia, Charlottesville, VA, United States

All authors contributed equally

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Phone: 1 212 463 0410 ext 55256  
Email: [shira.weiner@touro.edu](mailto:shira.weiner@touro.edu)

### Abstract

**Background:** Wikipedia is one of the most consulted health resources in the world. Since the public is using health information from Wikipedia to make health care decisions, improving the quality of that health information is in the public interest. The open editable content design of Wikipedia and quality control processes in place provide an opportunity to add high-value, evidence-based information and take an active role in improving the health care information infrastructure.

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<https://www.jmir.org/2019/3/e12450/>

J Med Internet Res 2019 | vol. 21 | iss. 3 | e12450 | p. 1  
(page number not for citation purposes)

# Topic tagging

Prior project in wiki

- ContentMine / ScienceSource / WikiFactMine
- ended 2019
- nice precedent



# Lots of orgs will develop

- University College London
- U of Virginia
- Cochrane





# Thanks!

Lane Rasberry  
Data Science Institute  
University of Virginia  
[rasberry@virginia.edu](mailto:rasberry@virginia.edu)



for Scholia, thanks Alfred P. Sloan Foundation

slides from SlidesCarnival.com



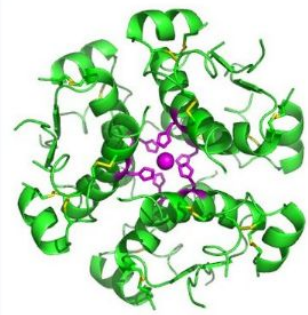
# Genewiki

Entries in Wikidata for every human gene.

Content in 10,000 Wikipedia articles for genes and proteins.

insulin, for example

**INS**



**Available structures**

**PDB** Ortholog search: [PDB RCSB](#)


**List of PDB id codes** [\[show\]](#)

**Identifiers**

**Aliases** [INS](#), [IDDM](#), [IDDM1](#), [IDDM2](#), [ILPR](#), [IRDN](#), [MODY10](#), [insulin](#)

**External IDs** [MGI: 96573](#) [HomoloGene: 173](#) [GeneCards: INS](#)

**Gene location (Human)** [\[hide\]](#)



# Show hospitals

Wikidata Query

Examples Help Tools

Query Helper

+ Filter

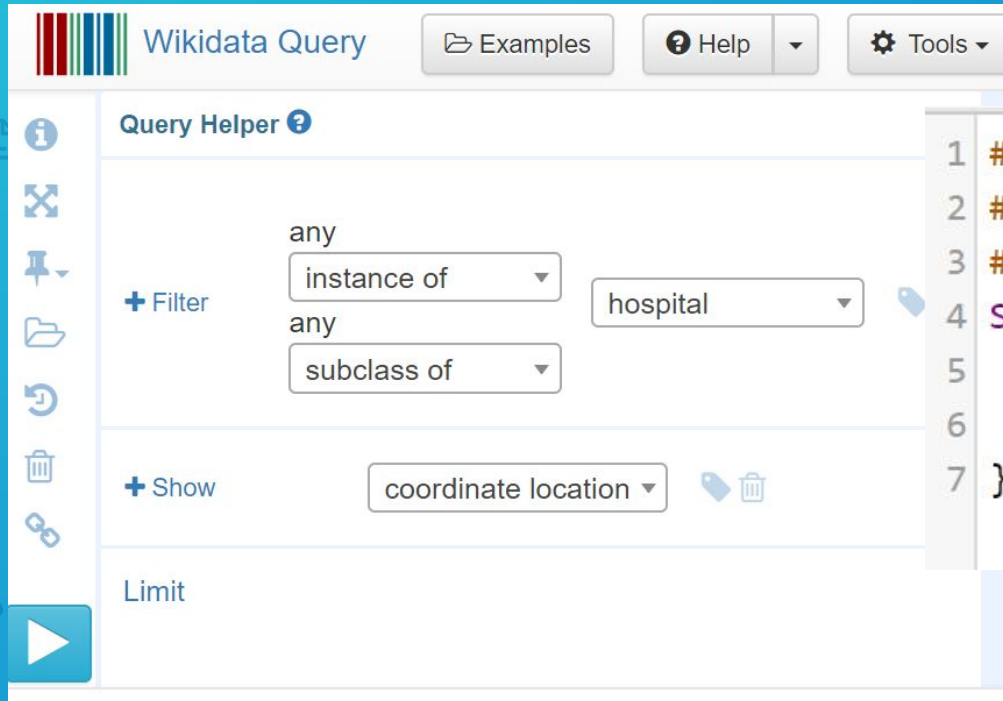
any  
instance of hospital

any  
subclass of

+ Show

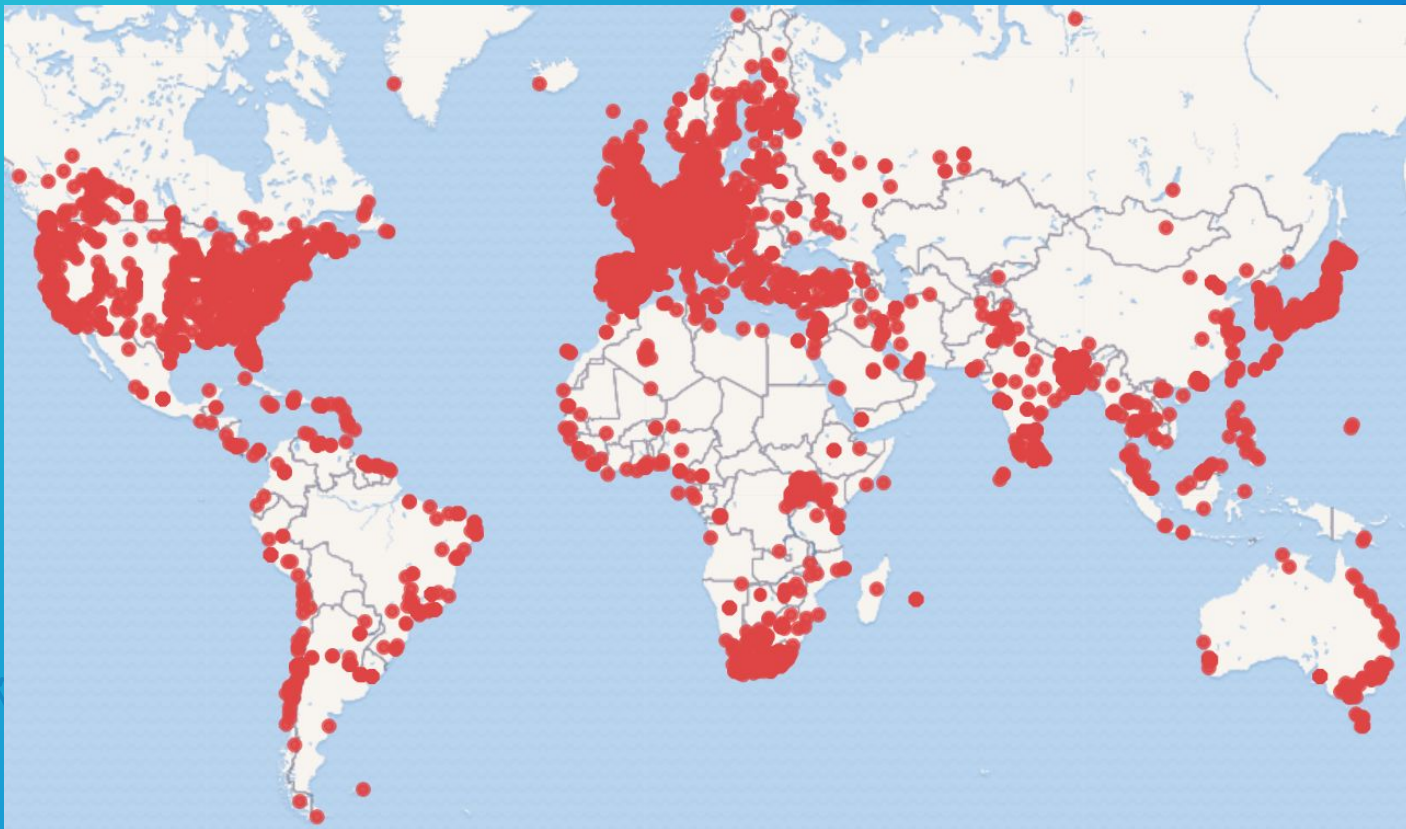
coordinate location

Limit



```
1 #Map of hospitals
2 #added 2017-08
3 #defaultView:Map
4 SELECT * WHERE {
5   ?item wdt:P31*/wdt:P279* wd:Q16917;
6   wdt:P625 ?geo .
7 }
```

# Show hospitals



Regions  
vary by  
coverage



# Woodwinds in art

Wikidata Query Service

Examples Help More tools

Query Helper

+ Filter

+ Show depicts

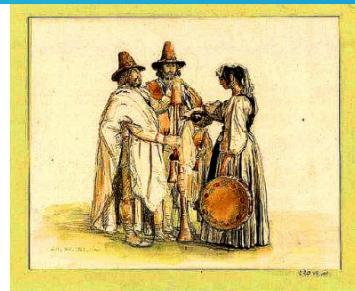
Limit

```
1 #Depicted objects in art work
2 #added before 2016-10
3
4 SELECT DISTINCT ?depicts (SAMPLE(?dL) AS ?depictsLabel)
5 WHERE
6 {
7     ?item wdt:P180 ?depicts .
8     OPTIONAL { ?depicts rdfs:label ?dL filter (lang(?dL)
9 }
10 GROUP BY ?depicts
11 ORDER BY DESC(?count) ?depictsLabel
```

# Woodwinds in art



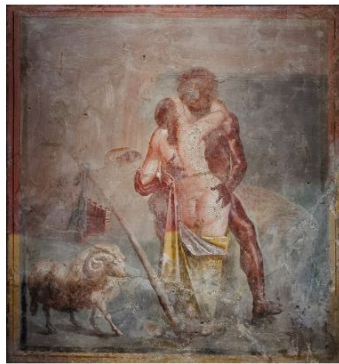
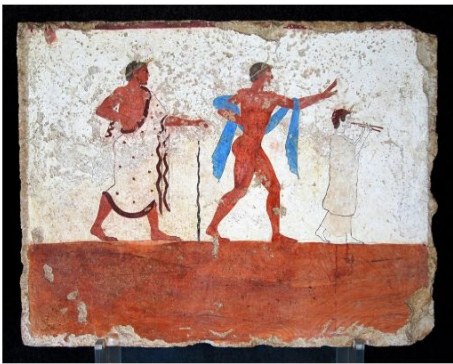
commons:Companion Persuading Radha as Krishna Flutes...  
Q Companion Persuading Radha as Krishna Flutes  
Q flute



commons:Jeune rom au tambourin versant du vin, Gu...  
Q Young Woman with a Tambourine Serving Wine  
Q bagpipes

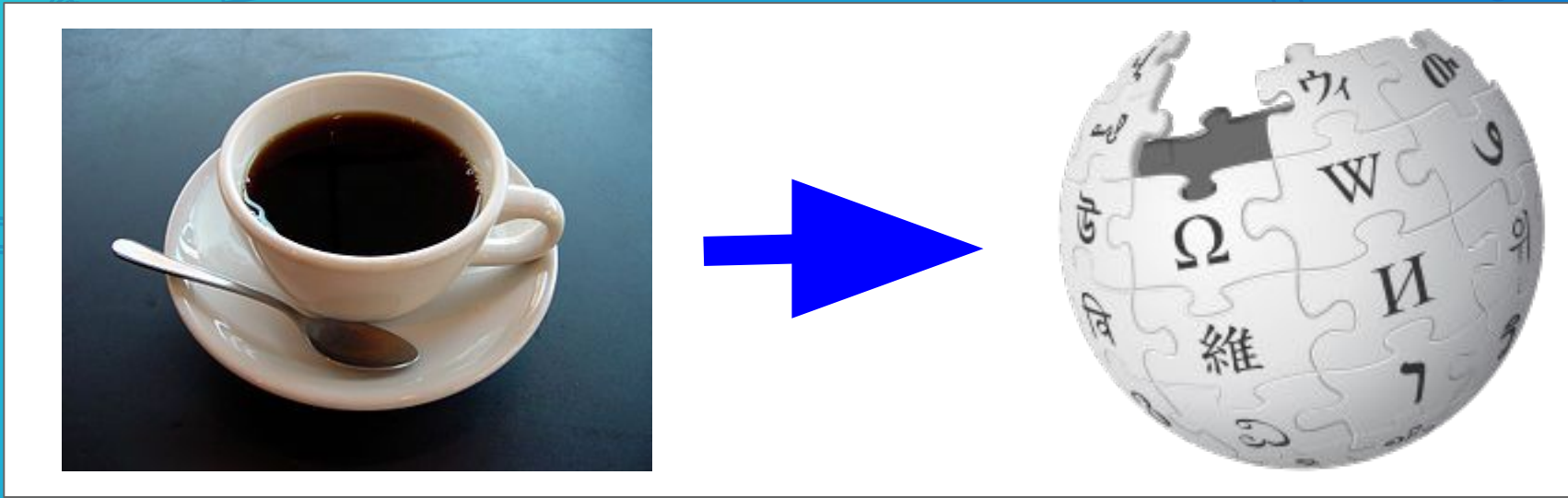


commons:Paestum tombeau plongeur c2.jpg  
Q Q42297864  
Q aulos









coffee social w/ wiki editing

# Popular Wiki meetup ideas

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## Skill set

- intro to data
- queries
- match catalogs

## Theme or expertise

- biographies
- media
- anyone else's event

# Connect with Wikidata

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ARL recommendation:  
Wikidata good for  
librarians, libraries,  
library users

The logo for the Association of Research Libraries is displayed on a white rectangular background. It features the text "ASSOCIATION OF RESEARCH LIBRARIES" in a bold, black, sans-serif font, arranged in three lines. Two diagonal slashes are positioned on either side of the text, one to the left and one to the right, creating a stylized frame around the words.

**ASSOCIATION  
OF RESEARCH  
LIBRARIES**

# Should institutions engage with Wikidata?

## Pros

1. highly popular for consumers
2. portal to Linked Open Web
3. gain crowdsourcing

## Cons

1. same criticisms as Wikipedia
2. nonprofit
3. outside wiki, low data literacy