

Misbeliefs and Biases in Health-Related Searches

Motivation

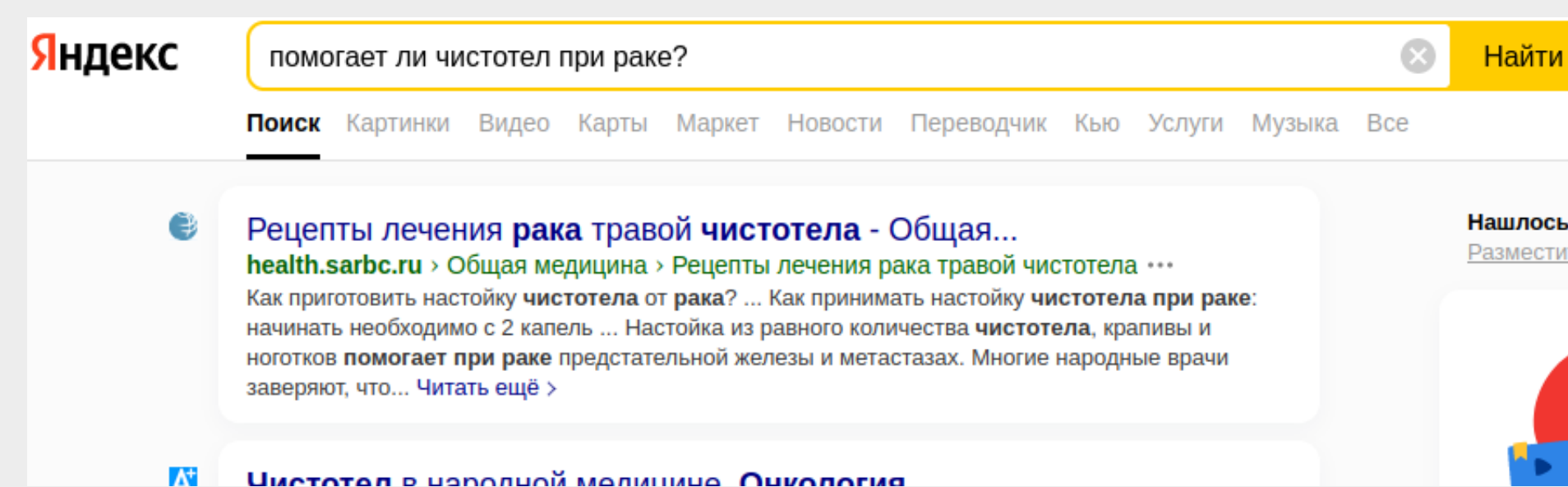
70% of people with Internet access use search engines to search about symptoms, diseases, and treatments [Fox and Duggan, 2013; Finney Rutten et al., 2019]

Health misinformation is widespread on the web [Dai et al., 2020]

People tend to believe that alternative medicine helps [Bhattacharya et al., 2012]

Searchers tend to trust the top-ranked result [Pogacar et al., 2017]

In 2013, more than 50% of search engines' top answers to medical yes/no questions were incorrect [White, 2013]



Does celandine help with cancer?

Recipes for treating cancer with celandine...

How to prepare celandine tincture for cancer? How to take celandine tincture for cancer: start with 2 drops ... Tincture of an equal amount of celandine, nettle and marigold helps with prostate cancer and metastases. Many folk doctors assure that ...

Top 1 snippet answers yes and provides a recipe how to prepare and take

No warning that celandine is toxic [Pantano et al., 2017]

Conclusion: Our results strongly suggest that the components of the natural plant protoberberine fraction (BBR-F) extracted from *C. majus* may represent promising novel photosensitive agents and can be applied in cancer photodynamic therapy as natural photosensitizers [Warowicka et al., 2019].¹

X No (maybe in future)

¹ <https://pubmed.ncbi.nlm.nih.gov/31465980/>

Data

1.5 billion questions submitted to Yandex in 2012

Diseases from the ICD codes (more formal, e.g., *malignant neoplasm*)

Wikidata entities subordinate to disease (more colloquial, e.g., *cancer*)

Medicinal plants from Wikidata and Wikipedia

Alternative remedies like honey or leeches from Wikipedia

4,398 disease names; 1,007 plant names; 49 alternative remedies

Yandex Log Analysis

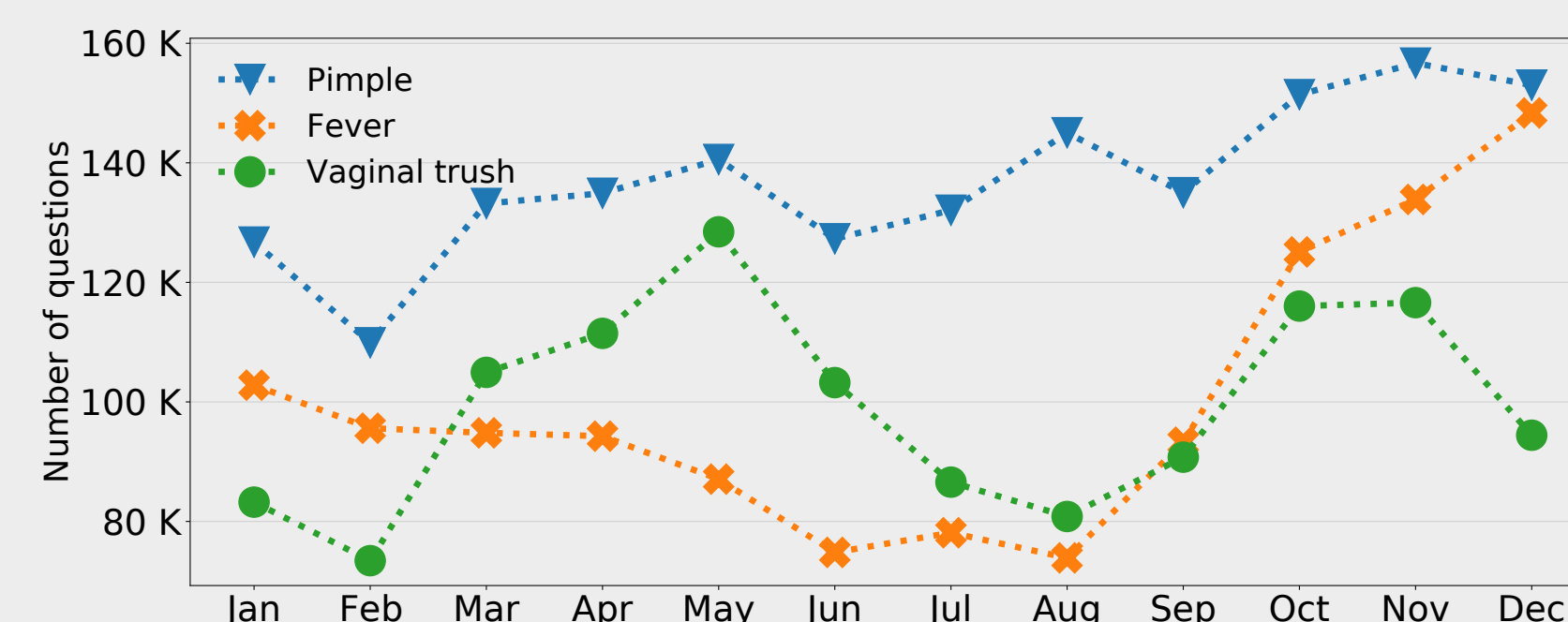
Frequency	Disease	Frequency	Symptom	Frequency	Cond./State
1,124,402	Vaginal thrush	2,675,642	Fever*	11,406,708	Pregnancy
900,845	Cancer*	1,646,372	Pressure*	1,457,167	Pimple
566,079	Allergy	1,345,203	Pain / ache	896,097	Virus*
551,672	Cold / flu	814,583	Cough	556,700	Abortion
444,797	Hepatitis	520,182	Delay*	412,830	Bruise
432,548	Quinsy	505,529	Runny nose	366,441	Immunity
428,525	Hemorrhoids	353,502	Inflammation	338,112	Burn
424,871	Cyst	336,160	Oedema	309,114	Wart
405,355	Cellulite	326,507	Diarrhea	301,974	Miscarriage
395,747	Herpes	218,207	Vomiting	291,874	Intoxication

~71 mln. questions (5% of the log) mention some disease

People ask more often about pimples than cancer

Most questions are about pregnancy

Frequency	Question
190,918	What is a vaginal thrush?
143,731	Why does one dream of pregnancy?
142,297	How to get rid of pimples?
70,123	How to get rid of pimples at home?
62,726	How to get rid of cellulite?
57,402	How to get rid of cellulite at home?
54,059	How to induce delayed periods?
52,153	How to boost immunity?
47,688	Can one make love during pregnancy?
46,749	How to get rid of dandruff?



Often: definitions and how to get rid of some medical condition

In summer less questions about fever

Questions about vaginal thrush are peaking in spring and autumn

Questions about pimples show the least deviation, increasing trend

Query log data might be an additional evidence for medical studies

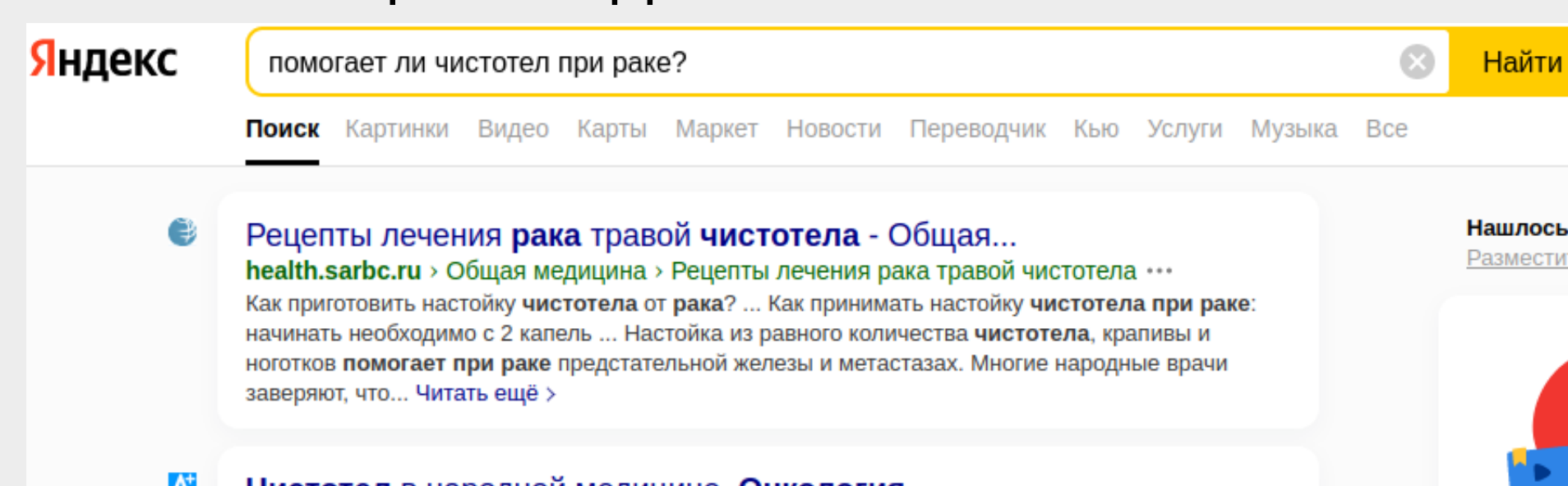
Search Result Analysis

For 30 frequent questions (15 yes/no and 15 about instructions)

Does celandine help with cancer? and *How to drink celandine for cancer?*

Cochrane, PubMed, and BioMed Explorer to find true answer

Annotated top 10 snippets:



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Answers question yes (no, not clear)

Contains recipe / instructions (or not)

No warnings (or there are)

How search engines answer potential health-related misbelief questions

~1.2 mln questions contain diseases and med. plants or altern. remedies

Belief confirmation like "Can hepatitis be cured with milk thistle?"

Established belief like "How to drink milk thistle to cure hepatitis?"

Misbelief questions: no scientific evidence that the remedy helps or clinical trials showed the opposite

Search Result Analysis

Яндекс

44% positively answer questions with untrue assumptions (i.e., misbeliefs)

6% give a correct 'no' answer

17% contain recipes and instructions

13% contain warnings about health risks

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32% positively answer questions with untrue assumptions (i.e., misbeliefs)

47% correctly say 'no'

12% contain recipes and instructions

10% contain warnings about health risks

Snippets tend to confirm health-related misbeliefs

Only few snippets contain warnings

For potential misbelief questions more attention should be put to the credibility