# Bibliometric Analysis of Scientific Output

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# Topics

- Introduction
- Bibliometry
- Where to Publish: Journal selection
- How to improve Citation Score
- Bibliometry Resources
- Portuguese Scientific Production Evaluation
  - Objectives
  - Data Collection
  - Results
  - Conclusion

# Introduction

- There are two main approaches for evaluating productivity:
  - Peer-review
  - Bibliometric methods
- Bibliometric studies based on data from scientific publications have shown a growing development in the most advanced countries in the last years

# Bibliometry

- What is Bibliometry?
- The discipline of measuring the performance of an author, a journal, a research activity, an institution or a country
- Enables quantitative and qualitative analysis of the scientific production through evaluation of the produced literature
- Essential tool for the study of research activity

# Where to Publish

- “It is better to publish one paper in a quality journal than multiple papers in lesser journal….”
- “Try to publish in journals that have high impact factors; chances are your paper will have high impact, too, if accepted.”

Bourne PE. Ten simple rules for getting published. PLoS Comput Biol. 2005;1(5):e57.

# Impact Factor

- Performance measure for Journals
- The journal in which papers are published have a strong influence on their citations
- Papers published in high-impact journals obtain, on average, twice as many citatitons as their identical counterparts published in journals with lower impact factors

Larivière V, Gingras Y. The impact factor's Matthew Effect: A natural experiment in bibliometrics. J Am Soc Inform Sci Technol. 2010; 61(2):424-27

# How can you improve your citation score?

# How can you improve your citation score?

- Write high quality papers
- Publish in the right journals
- Be consistent with names
- Cooperation

# Publish in the right journals

- Indexed in Science Citation Index
  - Prestige
  - Importance to discipline
- With a high Impact
- Open Access

# Be consistent with names

- Stick to one personal name, don´t vary with initials or family names
  - Such as: de Oliveira CF; Oliveira C; Oliveira CF; Freire de Oliveira C
- Use a standardized name for your affiliation – get your affiliation right

# Cooperation

- Teams increasingly dominate solo authors in the production of knowledge
- Research is increasingly done in teams across nearly all fields
- Teams typically produce more frequently cited research than individuals do

# Open Access

- Open Access = *"…free availability on the public internet, permiting any user to read, download, copy, distribute, print, search, or link to full texts of these articles…"*

  The Berlin Declaration 2003

# Open Access

- What is it?
- Free access online via the web to the world´s scholarly literature
- Free Access = Increased Impact

| Rank | Abbreviated Journal Title *(linked to journal information)* | ISSN | Total Cites | Impact Factor |
|---|---|---|---|---|
| 1 | CA-CANCER J CLIN | | | 87.925 |
| 2 | NAT REV CANCER | 1474-175X | 22298 | 29.538 |
| 3 | CANCER CELL | 1535-6108 | 15367 | 25.288 |
| 4 | J CLIN ONCOL | 0732-183X | 104253 | 17.793 |

Open Acces Journal

# Journal Selection

- Quantitative/Qualitative tools





# Web of Science: Science Citation Index

- Multidisciplinary citation database published by Thomson Scientific (formerly ISI)
- Founder Eugene Garfield and Irving Sher
- Developed in the 60´s
- Coverage of citation data 1900 - >
- Indexes articles of more than 10.000 journals
- They claim that just 3.000 major journals account for 92% of all citation in the sciences
- They (still) have monopoly position for citation data; they are the *Golden Standard*

# Web of Science: Science Citation Index

- Web of Science is a product offered on the platform Web of Knowledge (WOK), alongside other products including Journal Citation Reports
- Science Citation Index (SCI) is part of Web of Science
- SCI covers 7.000 journals

# Web of Science: Science Citation Index

- Using SCI you can find out:
  - Top cited work
  - What journals authors have published in
  - Who is citing them
  - Their h-index

# Journal of Citation Reports

- Provides quantitative tools for ranking, evaluating, categorizing and comparing journals
- We can view and compare impact factors of all journals within a subject area
- Derived using citation data in the Web of Science
- Widely accepted and used

# Impact Factor

- The IF cannot be used to compare journals across different subject areas
- Different citing behaviour across disciplines
- These reflect differences in disciplinary dynamics, **not** in quality
- Two year IF favours rapidly growing fields: rapidly changing and growing fields have much higher immediate citation rates

| | | |
|---|---|---|
| 1 | J INVEST DERMATOL | 5.543 |
| 1 | ANNU REV IMMUNOL | 37.902 |
| 1 | HUM REPROD UPDATE | 7.042 |
| 1 | CA-CANCER J CLIN | 87.925 |
| 1 | ANNU REV | 13.500 |
| 1 | J AM ACAD CHILD PSY | 4.983 |
| 1 | ENDOCR REV | 19.761 |

They all have the highest impact factor in their category

# Impact Factor

- One journal´s Impact Factor on its own doesn´t mean much
- Instead, it´s important to look at impact factors of multiple journals in the same area
- Benchmarking must be done using comparable variables

# Impact Factor

- Investigation journals are in better position than clinical journals:
  - Clinical papers quote investigational articles, but the opposite is not applicable
  - Clinical articles are more frequently read and used to improve diagnosis and treatment, but they are seldom cited
- Has an English language bias
- Database dominated by American publications

# Impact Factor

- In spite of great criticism, IF has developed as a kind of letter of introduction of the scientific journals
- A quality indicator since it is based on the recognition of its value by the scientific community through citation
- The widest used tool by the international scientific community for the evaluation of the quality of a scientific article or prestige of a journal

# Bibliometry Resources

- Till 2005, Web of Science was the sole available source to perform citation analysis
- In November 2004 two competitors emerged:
  - Scopus
  - Google Scholar
- 2005 sets the end of 40-years monopoly of citation analysis
- SCI now has competitors, but all works slightly differently, and until now is the major source for bibliometric studies

# SCImago Journal & Country Rank

- The SCImago Journal & Country Rank is a portal that includes the journals and country scientific indicators developed from the information contained in the Scopus database (Elsevier)
- These indicators can be used to assess and analyze scientific domains

# Objectives

- This study deals mainly with:
- The contribution of portuguese authors to the international scientific production in the specific area of Obstetrics & Gynecology

# Objectives

- Using compiled information, the following indicators were evaluated :

  - Quantitative (nº of articles)

  - Qualitative (journal impact factors; citations)

# Quantitative Indicators

- Productivity rate of institutions
- Productivity rate of authors
- Growth of national production in international publications

# Data Collection

- The study was perfomed using the Databases

- Web of Science (WOS) – http://isiknowledge.com

Until now WOS has been the major source for bibliometric analysis

- Scimago JR - http://www.scimagojr.com

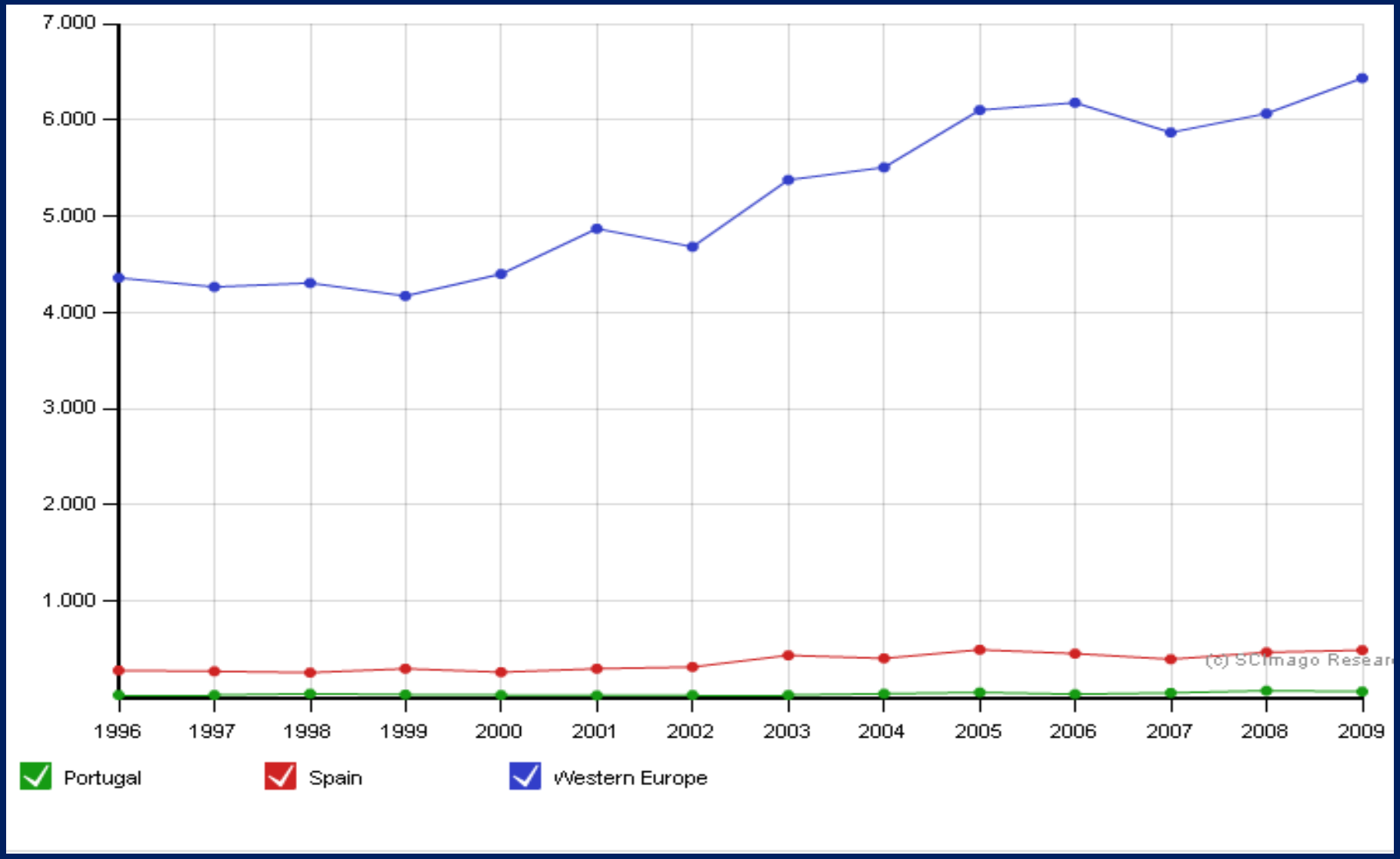
# SCImagoJournal & Country Rank

- Subject Area: Medicine
- Subject Category: Obstetrics & Gynecology
- Year : 1996-2009
- Countries: 185

# SCImago - Country Rankings

| | Country | Documents | Citable documents | Citations | Self-Citations | Citations per Document | H index |
|---|---|---|---|---|---|---|---|
| 1 | United States | 43.838 | 38.406 | 576.563 | 244.827 | 13,85 | 151 |
| 2 | United Kingdom | 18.210 | 15.484 | 207.722 | 49.938 | 12,14 | 122 |
| 3 | Germany | 11.285 | 9.441 | 80.242 | 19.362 | 7,40 | 80 |
| 4 | France | 9.667 | 7.966 | 73.030 | 17.460 | 7,87 | 83 |
| 5 | Italy | 7.980 | 7.336 | 85.195 | 15.971 | 11,49 | 84 |
| 6 | Japan | 6.543 | 6.330 | 55.877 | 11.881 | 8,34 | 64 |
| 7 | Australia | 5.186 | 4.611 | 65.830 | 11.665 | 13,97 | 86 |
| 8 | Spain | 5.042 | 4.710 | 33.733 | 6.257 | 7,26 | 70 |
| 9 | Canada | 4.577 | 4.111 | 66.348 | 9.281 | 16,56 | 86 |
| 10 | Turkey | 4.391 | 4.108 | 24.899 | 3.769 | 6,96 | 45 |
| 11 | Netherlands | 4.384 | 3.841 | 64.429 | 11.420 | 16,53 | 90 |
| 12 | Israel | 3.512 | 3.186 | 41.682 | 5.024 | 12,00 | 70 |
| 41 | Portugal | 419 | 362 | 3.745 | 494 | 10,95 | 28 |
| 42 | Singapore | 387 | 351 | 4.592 | 245 | 11,37 | 34 |
| 43 | Saudi Arabia | 360 | 335 | 2.858 | 148 | 7,72 | 27 |
| 44 | Cuba | 318 | 314 | 969 | 191 | 2,95 | 15 |
| 45 | Slovenia | 234 | 219 | 2.077 | 189 | 8,84 | 22 |
| 46 | Colombia | 213 | 205 | 1.274 | 65 | 10,09 | 18 |

# SCImago


7.000
6.000
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1996
1997
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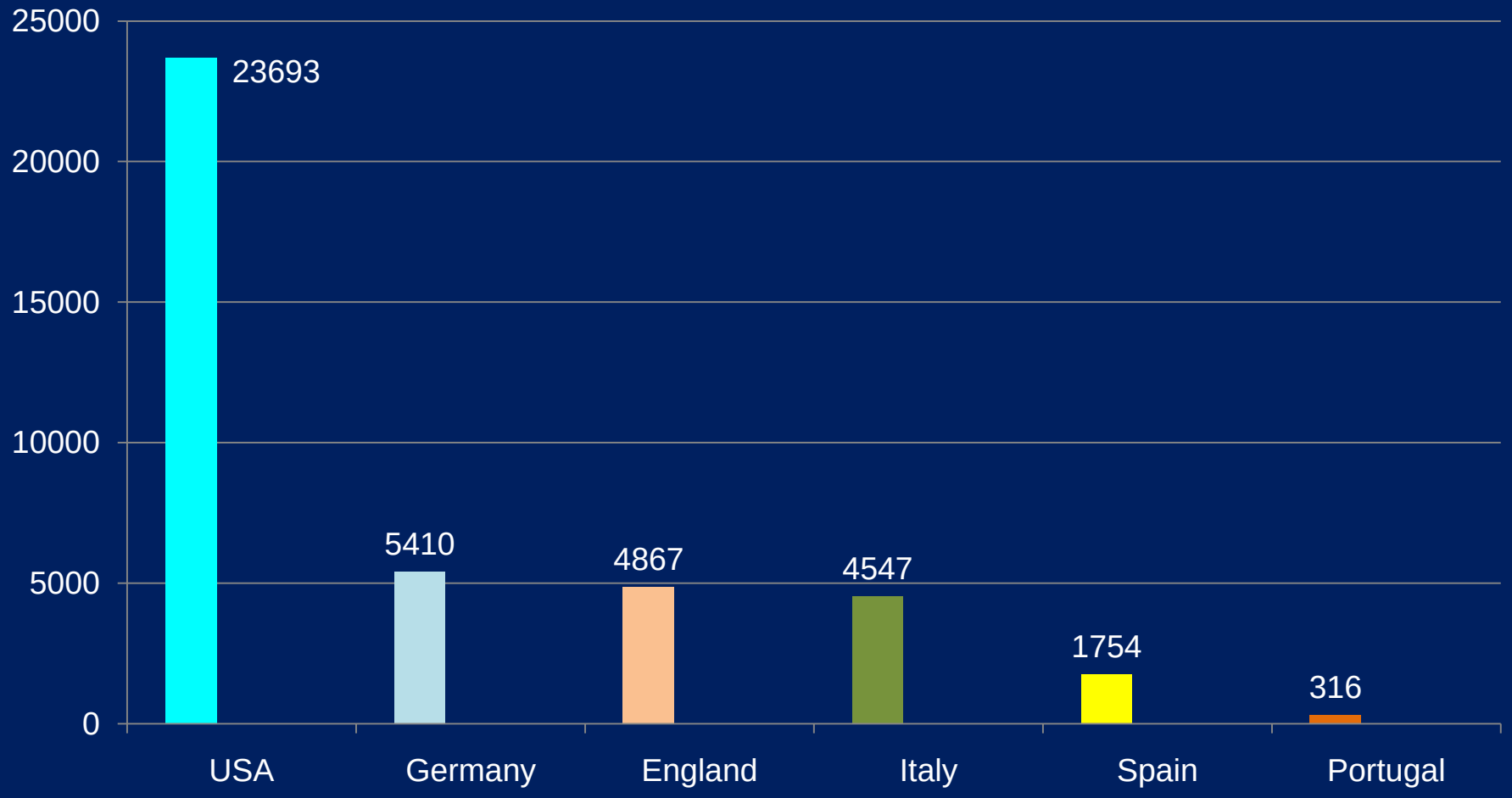
2005
2006
2007
2008
2009
Portugal
Spain
Western Europe

# SCI Search

- Collected all documents published between 2006 and 2010 where at least an author belongs to a portuguese department of gynecology, obstetrics or reproduction
- Considered all articles, independently from its tipology (reviews, clinical trials, letters, editorials…)

# Citation Report: Countries

- 2006- 2010 – 73.702 articles



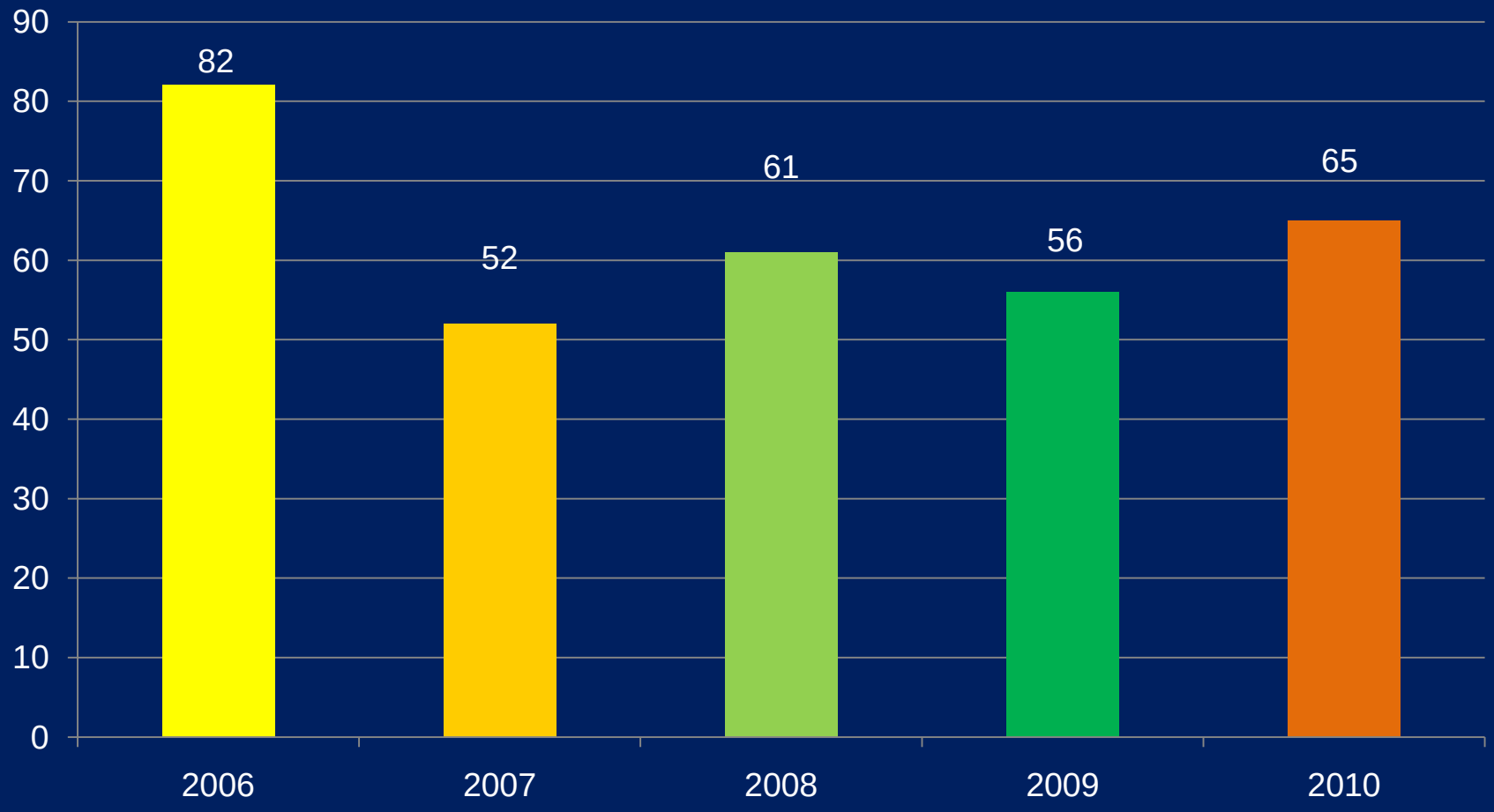
# Citation Report: Languages

- Total: 73.702 articles
- English – 71.984
- French – 1.260
- Spanish – 222
- Portuguese (Brazil;Portugal) – 75 (8 from the *Acta Médica Portuguesa*)
- German - 47

# Results

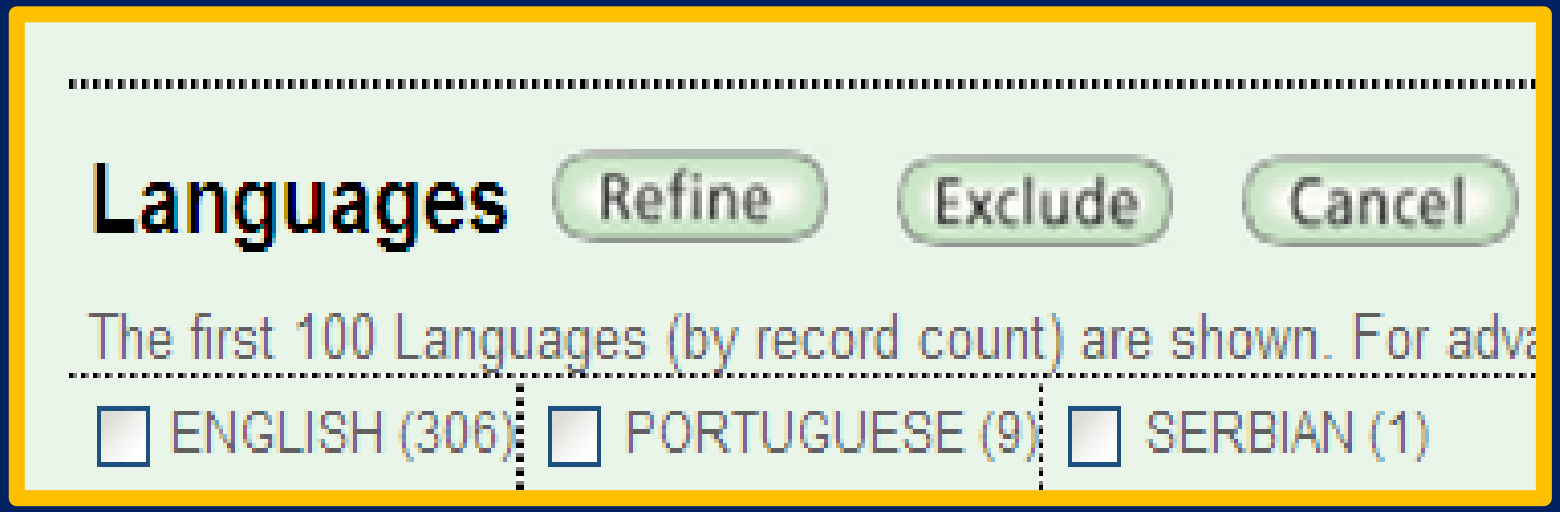
- Our study is based upon the analysis of the 316 IF articles

# Published Articles in each year

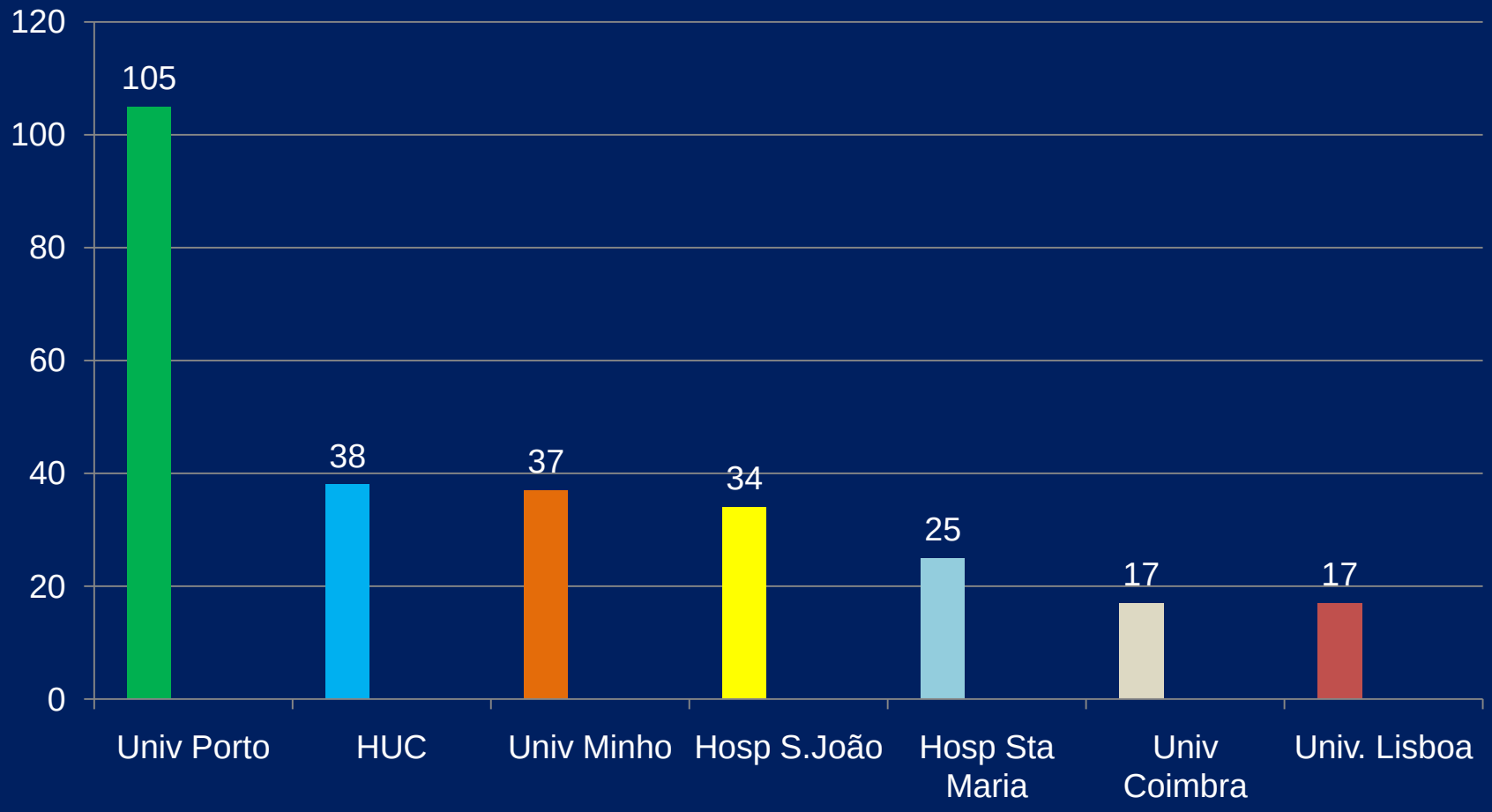


# Results

- The distribution of publications *per* language was:
  - 96,8% in english



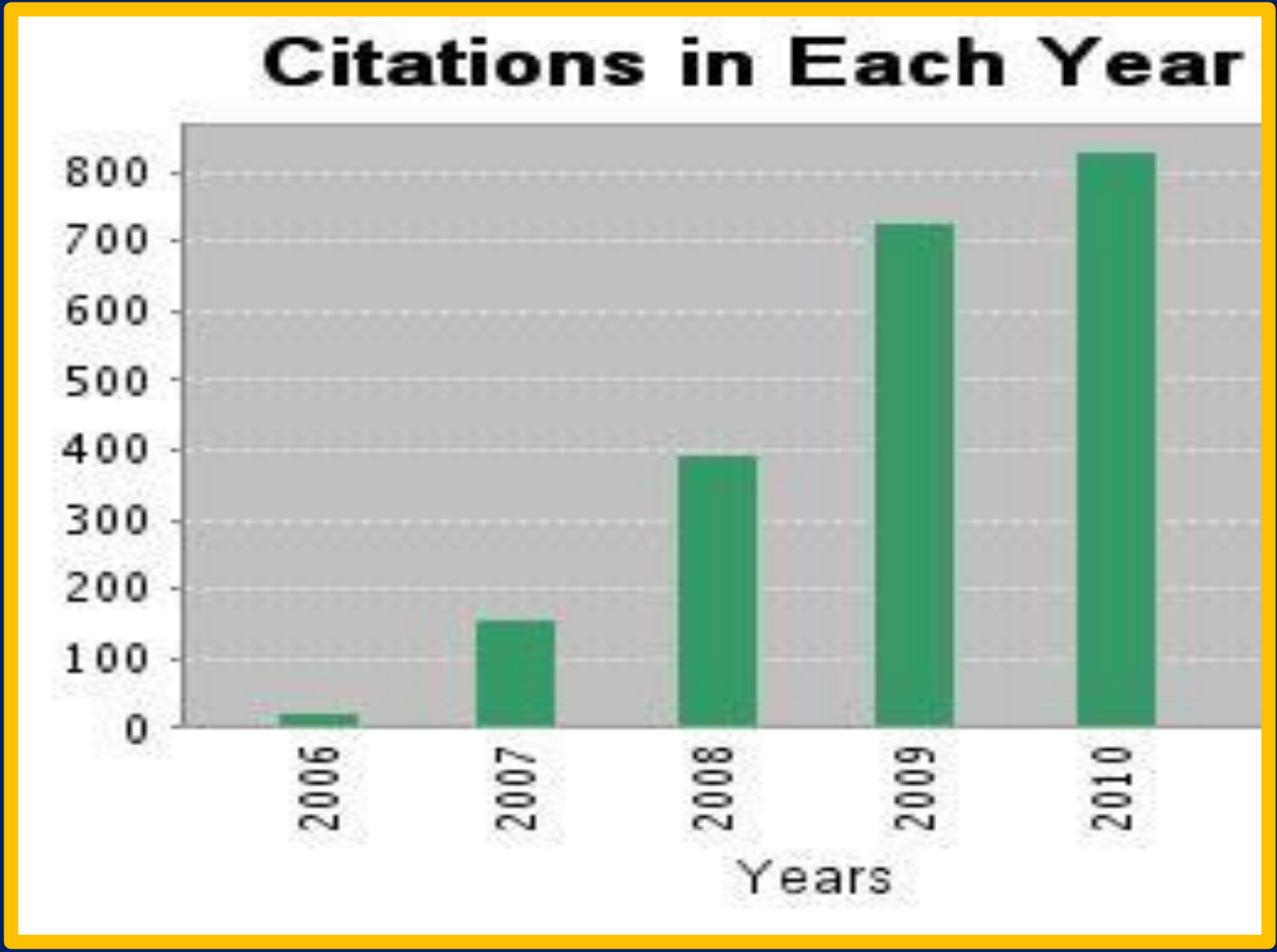
# Institutions with higher rate of publishing



# Qualitative Analysis of Results

- The impact of the overall portuguese scientific production in the area Obstetrics & Gynecology determined by the number of citations obtained by published articles

# Citations in each year



# Citation Report: Portugal

- Total 316
- Sum of the Times Cited – 2.171
- Average Citations per Item – 6,87
- H-index – 21

Hirsch JE. An index to quantify an individual´s scientific research output. PNAS. 2005 ;102(46):16569-72

# Citation Report

- Spain
  - Total 1.754
  - Sum of the Times Cited – 12.160
  - Average Citations per Item – 6,93
  - H-index - 44

- Portugal
  - Total 316
  - Sum of the Times Cited - 2.171
  - Average Citations per Item – 6,87
  - H-index - 21

# Citation Report

- Portugal
  - 0, 40 articles per Obstetrician/Gynecologist (~800)

- Spain
  - 0, 58 articles per Obstetrician/Gynecologist (~3000)

# Qualitative Analysis of Results

- Articles which gather international collaboration obtained a higher number of citations
  - More cited article (Oncogene 2007; Histopathology 2006)

  Times cited 130 ; times cited: 104

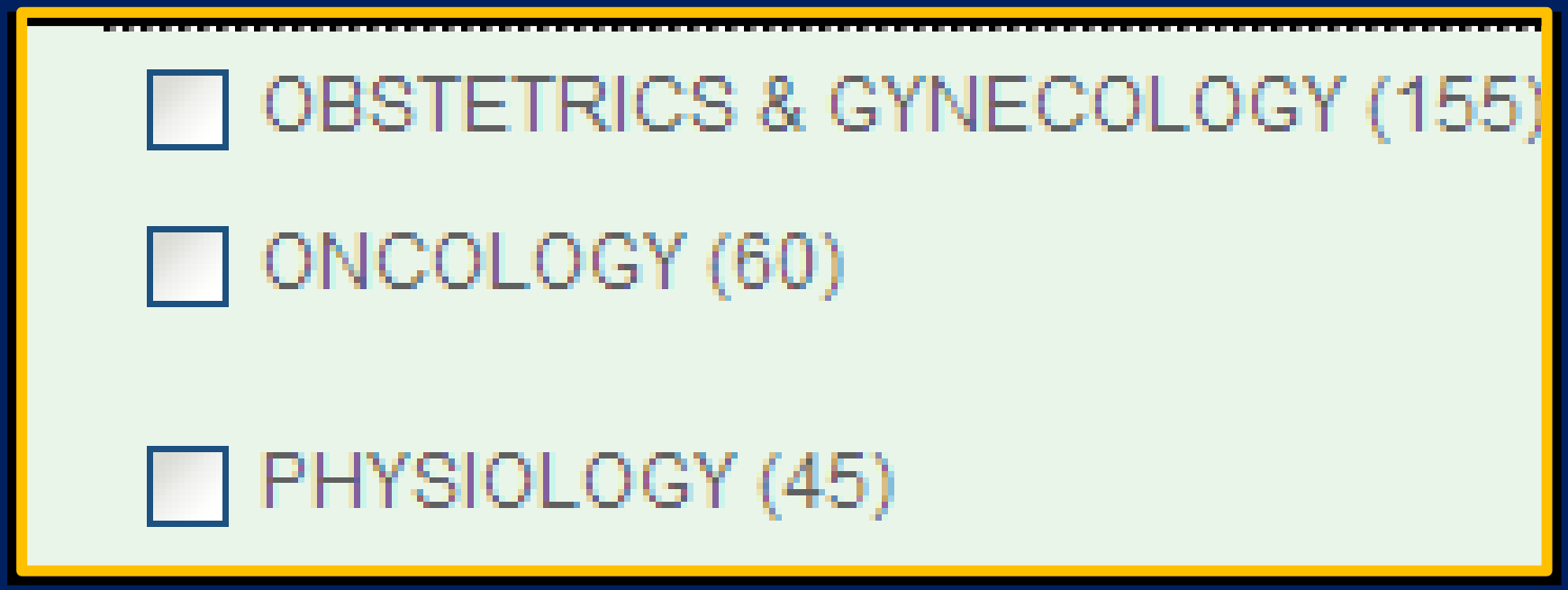
- Investigation articles are more frequently cited than clinical articles

# Qualitative Analysis of Results

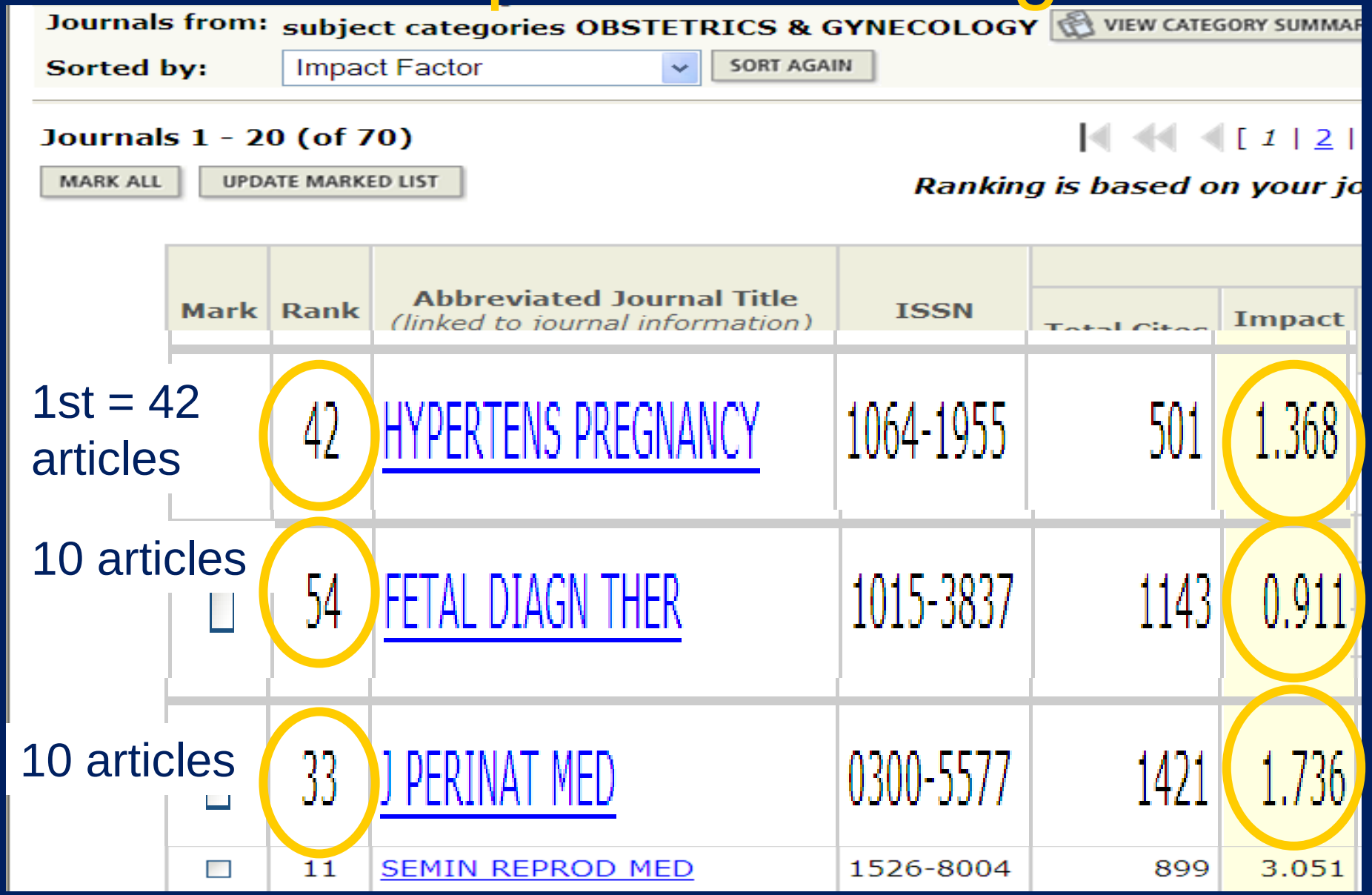
- 14 articles – times cited > 40 (all international colaboration)
- 27 articles – times cited <39 and >10 (9 without international collaboration)
- 37 articles – times cited = 1
- 161 articles – times cited = 0
- Majority were clinical papers

# Qualitative Analysis of Results

- 82,3% of the articles published in 3 subject categories



# Journals per JCR Categories



Journals from: subject categories OBSTETRICS & GYNECOLOGY VIEW CATEGORY SUMMAR

Sorted by: Impact Factor SORT AGAIN

Journals 1 - 20 (of 70) [ 1 | 2 |

MARK ALL UPDATE MARKED LIST Ranking is based on your jo

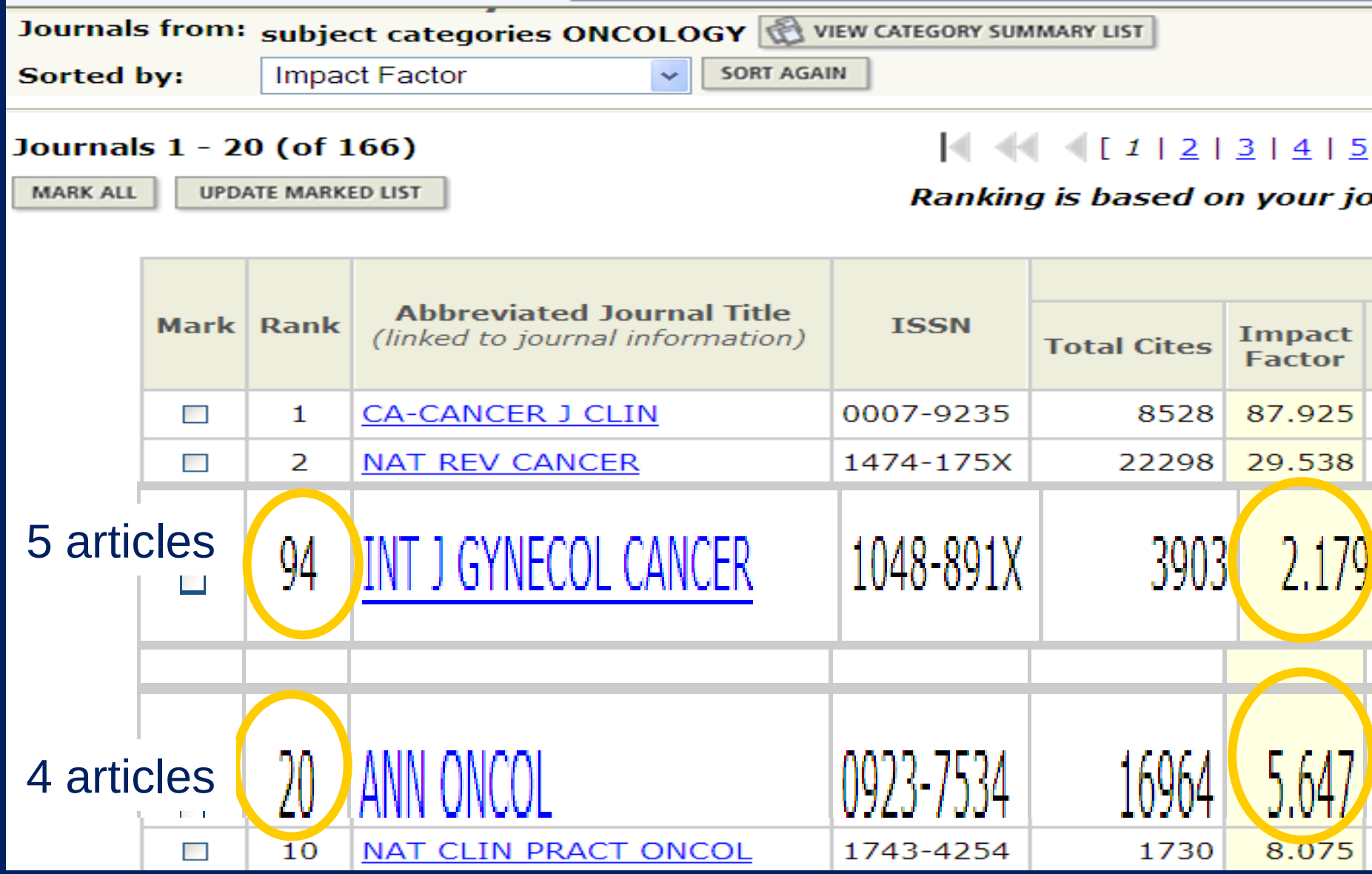
| Mark | Rank | Abbreviated Journal Title (linked to journal information) | ISSN | Total Cites | Impact |
|---|---|---|---|---|---|
| | 42 | HYPERTENS PREGNANCY | 1064-1955 | 501 | 1.368 |
| | 54 | FETAL DIAGN THER | 1015-3837 | 1143 | 0.911 |
| | 33 | J PERINAT MED | 0300-5577 | 1421 | 1.736 |
| | 11 | SEMIN REPROD MED | 1526-8004 | 899 | 3.051 |

1st = 42 articles

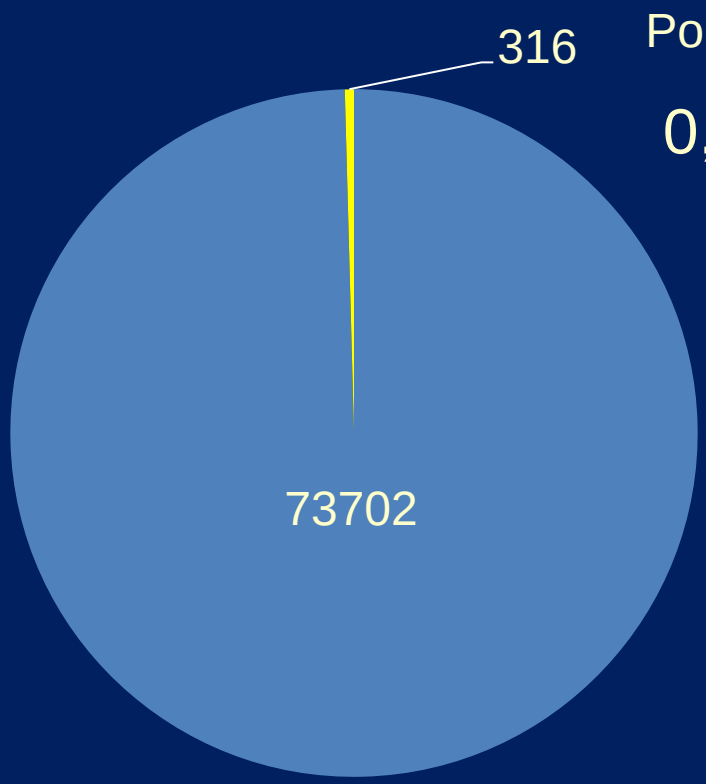
10 articles

10 articles

# Journals per JCR Categories



# International Scientific Production




Portuguese Contribution

0,42%

International Scientific production

# Conclusion

- Bibliometric Analysis
- Is very useful
- Should be used with care
- Excellent for keeping up with new articles and people
- Essential to evaluate research performance of individuals, departments, countries and the quality of scientific journals

# Recommended Literature


- Archambault E, Lariviere V.History of the journal impact factor. Scientometrics 2009;79(3), 635-49
- Bakkalbasi N, Bauer K, Glover J, Wang L. Three options for citation tracking: Google Scholar, Scopus and Web of Science. Biomed Digit Libr. 2006;3:7
- Falagas ME, Pitsouni EI, Malietzis GA, Pappas G. Comparison of PubMed, Scopus, Web of Science, and Google Scholar: strengths and weaknesses. FASEB J. 2008 22(2):338-42
- King DA. The scientific impact of nations. Nature 2004;430(6997):311-6
- Manske PR. The impact of the impact factor. J Hand Surg [Am] 2004;29(6):983-6
- Moya-Anegon FD. Coverage analysis of Scopus:a journal metric approach. Scientometrics 2007;73(1), 53-78
- Scully C, Lodge H. Impact factors and their significance; overrated or misused? Br Dent J 2005 ;198(7):391-3