# Publication trends in newspapers and scientific journals for SSRIs and suicidality: a systematic longitudinal study

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## Abstract

**Background:** In the period 2003–2008, the regulatory authorities issued several warnings restricting the use of SSRIs in paediatrics, in reaction to safety concerns regarding the risk of suicidality. In this study, the SSRIs and suicidality controversy served as a template to analyse the long-term dissemination dynamics of the benefit/risk profile of medications.

**Methods:** A systematic review of scientific articles (Embase), and NL and UK newspapers (LexisNexis) from 2000 to 2010 was performed. Categorization was done by 'effect' (related to suicidality risk and treatment effect), 'type of article' and 'age group'. The articles' positive–to–negative effect ratio was determined. Differences in distribution of 'effect' categories were analysed across sources, 'type of article', and 'age group' using the Mann–Whitney (2 sub–groups) or Kruskal–Wallis test (3 or more).

**Findings:** In total, 1141 articles were categorized: 352 scientific, 224 Dutch, and 565 British newspaper articles. Scientific articles were predominantly on research and were positive, whereas newspaper articles were negative (ratios=3.50–scientific, 0.69–NL and 0.94–UK; $P<0.001$). Articles on paediatrics were less positive in scientific journals and more negative in newspapers (ratios=2.29–scientific, 0.26–NL, and 0.20–UK; $P<0.001$), while articles on adults were positive overall (ratios=10.0–scientific, 1.06–NL, and 1.70–UK; $P<0.001$). In addition, negative-effect reporting trends were exacerbated following regulatory warnings and were generally opinion articles, both in scientific journals and newspapers (2003/4 and after 2007).

**Interpretation:** 'Good' news in scientific and medical journals is determined by a positive bias in research reporting, however, based on clinical studies

outcomes, whereas ‘bad’ news is related to opinion. The age group mentioned influenced whether an article conveyed a positive or negative effect message. Scientific journals and newspapers coincided in the nature and timing of opinion articles. The increase of negative-effect articles in scientific journals and newspapers following regulatory warnings indicates that the public has been informed in a timely fashion.

## Introduction

The news media are an important source of information about therapeutic drugs and health.[1] Coverage varies from communicating the benefits and risks of medications, to drug regulation and litigation, among others.[2,3] Scientific journals are a significant source of information for journalists writing about medicine.[4] However, this does not necessarily mean that 'good' or 'bad' news about medicines in the news media is determined by the scientific literature.[4,5] The 'good' news and 'bad' news in both news media and scientific and medical journals may be in agreement, but may also differ dramatically depending on the situation.[6,7]

Health care providers and consumers alike seek medical information from the news media and act on it accordingly, changing their perceptions and behaviour.[8,9] Coverage of medical news exemplifies how information from the news media and scientific journals can have a significant impact, yet be confusing.[7,10,11] Most newspapers' coverage studies of the benefits and risks of medications, although valuable, are short–term and lack a comparative perspective among countries.[2,8,12] Given the media's impact on public perceptions, which in turn might affect public trust in drug governance, health care providers, consumers and regulators should have a better understanding of the distinct process of knowledge dissemination by scientific journals compared to newspapers. The dissemination dynamics of 'bad' and 'good' news might differ when taking into account long-term reporting trends using a comparative perspective and during a drug safety controversy. In this study, the SSRIs and suicidality controversy (see box) serves as an example to study the long–term dissemination dynamics of the benefits and risks of medications. Hence, the

characteristics and dynamics of coverage on SSRIs and suicidality by scientific and medical journals and newspapers in NL and in UK were assessed from 2000 to 2010.

**The SSRIs and suicidality controversy**

In the period 2003–2008, regulatory authorities (FDA, MHRA and EMA, among others) issued several warnings restricting the use of SSRIs in paediatrics, in reaction to safety concerns regarding suicidal ideation.[13–15] While some scientists adulated the warnings, others expressed their concerns about the implied consequences.[16,17] The safety issue arose following GlaxoSmithKline's (GSK) request for a 6-month market exclusivity extension with the FDA for the use of paroxetine (a SSRI) to treat paediatric depression in response to the Food and Drug Administration Modernization Act (FDAMA). Consequently, GSK submitted the results from unpublished paediatric clinical data to the FDA. Meanwhile, the BBC aired a documentary entitled 'The secrets of Seroxat' on October 13 2002 in which it was alleged that internal documents of GSK showed that the dissemination of trial data on paroxetine in childhood depression was spun 'to minimize any negative commercial impact'.[18] GSK was accused of underplaying the association between SSRIs and suicidality. The ensuing worldwide media exposure played a role in driving the SSRI suicide controversy. In the process, confidence in the pharmaceutical industry and regulatory authorities decreased significantly.[19] To date, the controversy remains unsettled, albeit evidence also suggests that SSRIs are useful first–line treatments for depression and most anxiety disorders but exhaustive monitoring is recommended during the initiating phase.[20]

## Methods

### Time frame

Content analysis was performed on articles published in the period January 2000 to December 2009, including the period in which the regulatory warnings were repeatedly enforced, i.e., 2003/4 and 2007.

### Data sources

Scientific articles were extracted from Embase (compilation of Medline and 2000 extra journals not covered by Medline) using two sets of keywords, i.e., first: 'serotonin uptake inhibitor' NOT 'serotonin noradrenalin reuptake inhibitor' AND 'suicidal behavior' or 'automutilation' or 'aggression' AND 'depression'; and second: 'serotonin uptake inhibitor' NOT 'serotonin noradrenalin reuptake inhibitor' AND 'suicide'. The search was limited to 'humans', and 'Dutch' and 'English' language.

Newspapers articles were extracted using the LexisNexis database from a selection of high–circulation newspapers in NL (n=six) and in UK (n=four). The newspapers analysed were: *De Telegraaf*, *Algemeen Dagblad*, *De Volkskrant*, *NRC Handelsblad*, *Trouw* and *Het Parool* for NL; and *The Sun*, *Daily Mail*, *The Daily Telegraph* and *The Times* for UK. The newspapers' circulation figures (per country) covered 11% of each total resident population.[21,22] Search queries were performed in the language of the papers (Dutch and English). Dutch articles were retrieved using the terms 'antidepressiv!' or 'anti–depressiv!' or 'SSRI!' or 'serotonine!' AND 'zelfmoord!' or 'aggressi!' or 'geweld!' or 'kwaad!' or 'suicid!' AND 'depressi!'. British articles were extracted using the terms 'antidepress!' or

'anti–depress!' or 'SSRI!' or 'serotonin!' AND 'suicid!' or 'aggressi!' or 'violen!' or 'harm!' AND 'depressi!'.

**Data classification**

All articles addressing SSRIs, depression, suicidal thoughts, or suicide as the main topic were eligible for analysis. If that was not the case, such an article was categorized as 'out of context', e.g., articles reporting the use of SSRIs to treat premature ejaculation or neuralgia. All scientific and newspaper articles were analysed on the content of full–text, except for scientific articles where the abstract information was regarded as sufficient for categorization. The 'effect', 'type of article', and 'age group' categories were independently determined for these articles by two researchers.

The 'effect' category was divided into positive, neutral, and negative. Articles reporting on positive therapeutic outcomes with no confirmation of causality between SSRIs and suicidal behaviour were classified as positive. Consequently, articles reporting on the association between SSRI use and suicidality, with little or no mention of positive therapeutic outcomes, were classified as negative. Articles with a balanced message (positive and negative effects) were classified as neutral. The 'type of article' category was defined within scientific journals as: case study (patient report), research (study results, such as RCTs, meta–analyses, observational studies, etc.), opinion (letters, commentaries, replies, etc.), and policy (regulatory–related, etc.). The definition of 'type of article' in newspapers was based on the nature of the news: interview, opinion (author's perspective), news report (informative news or general journalism), science journalism (scientific information or reports), and policy (reimbursement,

change of indication, etc.). Finally, the 'age group' category considered adults (above 18 years old), paediatric (18 years old or younger), both (adult and paediatric) or unspecified.

Scoring discrepancies between the two researchers occurred in approximately 5% of all articles. In a case of discrepancy, the categorization of the article in question was settled by consensus.

### Data analysis

The positive–to–negative ratio of the 'effect' category was calculated (per source, 'type of article', and 'age group' categories). For the statistical analyses, the total count of articles per category was used. Differences in distribution of the 'effect' categories (positive, neutral and negative) were analysed across the sources (Embase, Dutch and/or UK newspaper articles); 'type of article', and 'age group' were analysed using the Mann–Whitney (2 sub–groups) or Kruskal–Wallis test (3 or more). Statistical significance was defined as $P<0.05$. Statistical analyses were performed using SPSS software (release 18.0.3).

To assess the publication dynamics, the number of articles (in scientific journals and/or in newspapers) was plotted per year (2000–2010), and per category ('effect', 'type of article', or 'age group').

## Results

A total of 1736 articles were retrieved based on the predefined key word sets. Of these, 1141 articles were fully categorized: 352 scientific, 224 Dutch newspaper articles and 565 British newspaper articles (Figure 1). The characteristics of the articles are listed in Table 1.

**Publication patterns of the 'effect' category**

Of all 1141 articles (scientific and newspapers), the positive-effect category (39%) was significantly larger than the negative-effect (31%) or the neutral-effect categories (30%; P<0.001). The differentiation of the 'effect' category by source showed that scientific journals were predominantly positive (ratio=3.5), whereas Dutch and British newspapers coverage of 'effect' was mainly negative (ratios=0.69–NL and 0.94–UK, Table 1). Statistically significant differences were observed in 'effect' classification for scientific journals and newspapers (both P<0.001), but not between NL and UK dailies (P=0.116, Table 2).

Although the overall coverage of 'effect' was generally positive in scientific journals, temporal changes were observed in the positive–to–negative 'effect' ratio per year, indicating a less positive-effect trend during 2003/4 and after 2007. Newspaper reporting revealed a similar trend as scientific journals. However, the positive–to–negative 'effect' ratio per year in newspapers shifted to the negative side from 2003 to 2005 and after 2007 (Figure 2B). This specific increase in negative–effect articles in newspapers was characterized by repetitive reports about lawsuits (e.g., lawyers' unsubstantiated claims of a causal association between murder and suicide attempts and the use of SSRIs), whistle–blowers or other media interventions, which fuelled the discussion.

**Publication patterns of the 'type of article' category**

Scientific journals published generally research articles (60%), carrying a positive-effect message (ratio=8.5, Table 2). To a lesser extent, scientific journals published opinion articles (34%), which conveyed an overall positive–effect message (ratio=1.2, Table 2). However, scientific opinion articles displayed

major temporal changes in the positive–to–negative 'effect' ratio following regulatory warnings, showing more negative–effect articles. The nature of these articles was primarily criticism of methodological issues or the author's perspective on SSRIs. Differences of 'effect' distributions related to 'types of article' were statistically significant (P<0.001, Table 2).

Newspapers published mainly news report articles (50.5%) and carried an overall negative–effect message (ratio=0.5, Table 2). A similar negative–effect trend was measured in scientific journalism articles (ratio=0.7). Newspaper opinion articles also portrayed an overall positive–effect message (ratio=2.1), as observed for opinion articles in scientific journals (ratio=1.2, Table 2). Major temporal changes in the positive–to–negative 'effect' ratio of newspaper articles were visible in the period of regulatory warnings (2002–2005 and 2007–2008, Figure 2B). Differences between 'effect' distributions related to 'types of article' were statistically significant in the accumulated newspaper articles group, UK newspaper articles (P<0.001), and in NL newspaper articles (P=0.011).

**Publication patterns of the 'age group' category**

Scientific journals reported more frequently on paediatrics (31%) than on adults (25%; P<0.001). Articles on adults were notably more positive concerning 'effect' compared to paediatric articles (ratio=10 and 2.3, Table 2).

Newspapers paid more attention to adults (56%) than paediatrics (15%, Table 1). Reporting trend for articles on adults was primarily positive about 'effect', whereas those on paediatrics were mainly negative (ratio=1.5 and 0.2). Significant differences were found between 'effect' distributions in newspapers

related to ‘age group’ (P<0.001). Reporting patterns between NL and UK dailies were comparable in all three categories (P=0.116, Table 2).

Articles on paediatrics in scientific journals and in newspapers displayed similar publication dynamics, i.e., a significant peak in 2004, following the warnings. The publication dynamics of articles on adults in scientific journals and newspapers also showed a similar pattern. Thereafter, newspaper articles on adults continued to increase until 2010, while their scientific counterparts remained more or less stable (Figure 3).

## Discussion

This study assessed the characteristics and dynamics of SSRIs and suicidality coverage by scientific and medical journals in general, and newspapers in NL and UK from 2000 to 2010. Scientific journals published predominantly research articles about positive therapeutic outcomes with little mention of causality between SSRIs and suicidality, particularly in adults. Despite different ethnic backgrounds (e.g., tabloid culture in UK, among others) and language, newspaper reporting trends in NL and UK were comparable; and were overall negative regarding the therapeutic effect of SSRIs in paediatrics, while positive–effect reporting prevailed for adults.

The present study has several limitations. It covered 11% of the total population per country based on newspaper circulation figures. Nevertheless, the sample size might be representative (n=789 newspaper articles) since we aimed to understand the type and quantity of information the public receives. Although reporting trends between countries were comparable, these results must be extrapolated carefully to other countries. Notwithstanding several keyword sets

were used to extract the articles, some relevant articles might have been omitted. Our sample is, however, random and therefore provides a representative overview of what has been published on SSRIs and suicidality. Other news media channels (television, radio, magazines, or the Internet) were not explored. It would be interesting to analyse the dynamics of knowledge dissemination by other channels during a drug safety event. However, the systematic analysis of Internet data remains methodologically complicated since web sites, blogs, forums, etc, come and go easily, and yet is a massive source of (mis-) information.

The finding that scientific and medical journals reported mainly positive therapeutic outcomes regarding SSRIs might be the influence of a publication bias in research articles, based on clinical study outcomes. Our results are consistent with previous work, which demonstrated that antidepressant trials with a positive outcome were published more often than those with negative outcomes.[23] However, we differentiated that the positive–effect reporting trend still dominated after the regulatory warnings. Studies questioning these warnings, and the possible disservice they did to public health (e.g., the possible inverse association between SSRIs prescriptions and suicidality, or the decline in treatment of depression in paediatrics) contributed to this post–warning positive–effect trend.[16,17] On the other hand, the newspaper dissemination of scientific-based evidence to the public revealed inconsistencies. For instance, science journalism articles (newspapers) that presented an overall negative–effect regarding SSRIs (ratio=0.7), could not be related to the overall positive–effect reporting trend found in scientific and medical journals. These findings indicate that either newspaper journalists may selectively report scientific

outcomes to the public, as also stated in the CHMP assessment report on antidepressants,[24] or that controversial, and sometimes misleading, topics might be selected to increase readership.[4,10,25,26] Such practices might generate confusion, since the translation of evidence–based medicine to the public is not uniform.[2,12,27] However, scientific and medical journals might also do disfavour to the scientific community by favouring positive outcome studies, thus limiting the journalists' sources of accurate and critic information to communicate to the public new scientific and medical evidence.

Alterations in publication trends of scientific and medical journals and newspapers could be the direct result of the controversy. The uncertainties regarding the SSRIs' benefit/risk balance, primarily in paediatrics, have led to the restriction of almost all SSRIs under 18 year olds in 2003 and further restrictions for young adults (18 to 24 years old) in 2007.[13–15,28] In the same periods, our data revealed shifts towards negative–effect reporting trends in scientific and newspaper articles on paediatrics and opinion articles. A causal association between this sudden publication growth and the regulatory warnings was not assessed. However, the timing between the warnings and the observed increase in articles might substantiate the possible influence of warnings on media publication trends. Moreover, this increment in the number of articles might also indicate that newspapers informed the public about this particular drug safety event in a timely fashion. Burns et al. underlined the public's right to be informed about medical news within a suitable time frame.[29] However, their study only focused on two high-ranked scientific journals, whereas we did not discriminate among scientific journals. A balance between timely coverage and high–quality information is fundamental when

reporting on drug safety controversies. Ideally, this balance should be the result of open dialogue between healthcare practitioners, academia, governmental agencies, the pharmaceutical industry, journalists and the lay public. Eventually, the public ought to and will be properly educated about the benefits and the risks of medicines by doing so.[30] And, more importantly, public trust will be maintained during unsettling periods.

The implications of the SSRIs and suicidality debate for mentally ill patients must be more adequately addressed. It has been demonstrated that news media reports (on suicide, or related to suicide) have an influence on suicidal behaviour, and on drug usage.[31,32] Further research in this regard might determine the long-term extent to which scientific journals and newspapers influenced this group of patients by investigating the long-term prescribing behaviour of SSRIs.

## Conclusion

Publication trends in scientific journals and newspapers, during a drug safety controversy, appear to be more affected by regulatory actions, opinion or lawsuits, than by a straightforward translation of evidence–based medicine. The apparent positive publication bias, based on clinical study outcomes, does not seem to prevent the dissemination of 'bad' news about medications. Agreements in the nature of opinion reports were found in scientific journals and in NL and UK dailies. The occurrence of 'good' or 'bad' news in scientific journals and newspapers was found to be dependent on the news category or type of article. The increase in the number of articles in scientific journals and in newspapers during regulatory warnings might indicate that prompt news dissemination

through these channels has helped to inform the public about this drug safety controversy in a timely fashion. It also shows that a proactive and transparent risk communication strategy of regulatory offices and the pharmaceutical industry might pay off in the long run for reporting on the benefits and risks of medications.

WHAT IS ALREADY KNOWN ON THE SUBJECT

- Coverage of health related issues exemplify the relevance of scientific journals evidence through news media to inform the public, yet information might be distorted or confusing in some cases.
- The coverage of drug safety controversies in newspapers vis-à-vis scientific journals has not been thoroughly studied.

WHAT THIS STUDY ADDS

- A positive publication bias was confirmed in scientific journals, however, based on clinical studies outcomes, whereas 'bad' news in scientific journals and newspapers was related to opinion, not evidence.
- This 'bad' news trend was connected to the regulatory warnings, meaning that the public was informed on time about the SSRIs and suicidality controversy, although the information that reached the public was not uniform.
- An open dialogue between stakeholders will improve communication to the public and will educate them about the benefits and risks of medicines, especially during a drug safety controversy.

**Table 1.** Characteristics of the 1141 articles in NL & UK newspapers and in scientific journals (2000–2009)

| Characteristics | Scientific Journals (n=352) | NL newspapers (n=224) | UK newspapers (n=565) |
|---|---|---|---|
| **Effect*** | | | |
| Positive | 191 (54) | 65 (29) | 192 (34) |
| Neutral | 106 (30) | 66 (29) | 169 (30) |
| Negative | 55 (16) | 93 (42) | 204 (36) |
| Positive to negative ratio | 3.5 | 0.69 | 0.94 |
| **Type of article** | | | |
| Case study | 13 (4) | N/A | N/A |
| Research | 210 (60) | N/A | N/A |
| Opinion | 121 (34) | 25 (11) | 107 (19) |
| Policy | 8 (2) | 11 (5) | 10 (2) |
| Interview | N/A | 38 (17) | 77 (14) |
| News report | N/A | 110 (49) | 291 (52) |
| Science journalism | N/A | 40 (18) | 80 (14) |
| **Age group** | | | |
| Adults | 89 (25) | 128 (57) | 313 (55) |
| Paediatric | 108 (31) | 30 (13) | 92 (16) |
| Both | 80 (23) | 32 (14) | 66 (12) |
| Unspecified | 75 (21) | 34 (15) | 94 (17) |

*Statistically significant differences in effect classification were observed between scientific journals and newspapers (P<0.001), but not between NL and UK dailies (P=0.116). N/A=not applicable.

**Table 2.** Allocation of effect categories related to types of article and age groups, and differentiated by source (NL & UK newspaper articles combined)

| Categories | | Positive | Neutral | Negative | Positive to negative ratio | p-value |
|---|---|---|---|---|---|---|
| NL newspapers | | 65 | 66 | 93 | 0.69 | 0.116 |
| UK newspapers | | 192 | 169 | 204 | 0.94 | |
| Scientific journals | | 191 | 106 | 55 | 3.50 | <0.001 |
| NL & UK Newspapers (mixed) | | 257 | 235 | 297 | 0.86 | |
| **Type of article** | | | | | | |
| Scientific journals | Case study | 4 | 4 | 5 | 0.80 | <0.001 |
| | Research | 144 | 49 | 17 | 8.47 | |
| | Opinion | 39 | 49 | 33 | 1.18 | |
| | Policy | 3 | 5 | 0 | 3.00 | |
| Newspapers* | Interview | 69 | 30 | 16 | 4.31 | <0.001 |
| | News report | 88 | 125 | 188 | 0.47 | |
| | Science journalism | 38 | 30 | 52 | 0.73 | |
| | Opinion | 60 | 43 | 29 | 2.07 | |
| | Policy | 2 | 7 | 12 | 0.17 | |
| **Age group** | | | | | | |
| Scientific journals | Adults | 70 | 12 | 7 | 10.0 | <0.001 |
| | Paediatric | 48 | 39 | 21 | 2.29 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Both | 33 | 29 | 18 | 1.83 | |
| | Unspecified | 40 | 26 | 9 | 4.44 | |
| Newspapers | Adults | 176 | 145 | 120 | 1.47 | <0.001 |
| | Paediatric | 18 | 20 | 84 | 0.21 | |
| | Both | 22 | 33 | 43 | 0.51 | |
| | Unspecified | 41 | 37 | 50 | 0.82 | |

* Statistically significant differences in effect distributions related to types of article were also observed in UK newspaper articles (P<0.001), and in NL newspaper articles (P=0.011).

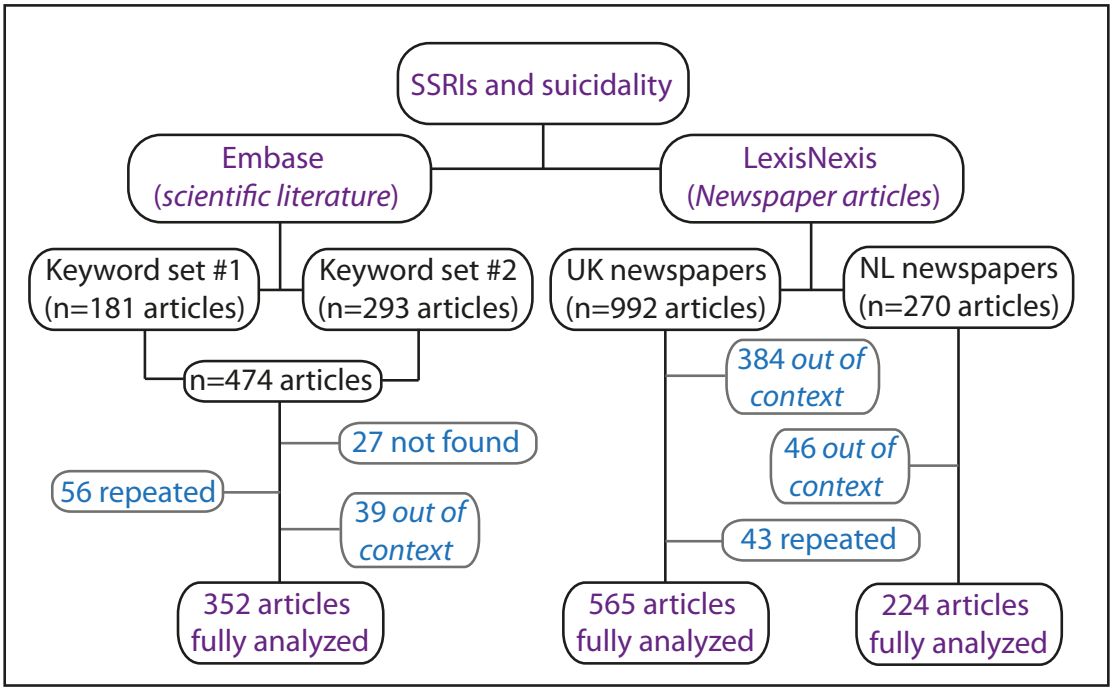


**Figure 1. Scheme of the search process performed in the scientific and medical literature and in NL & UK newspapers.**

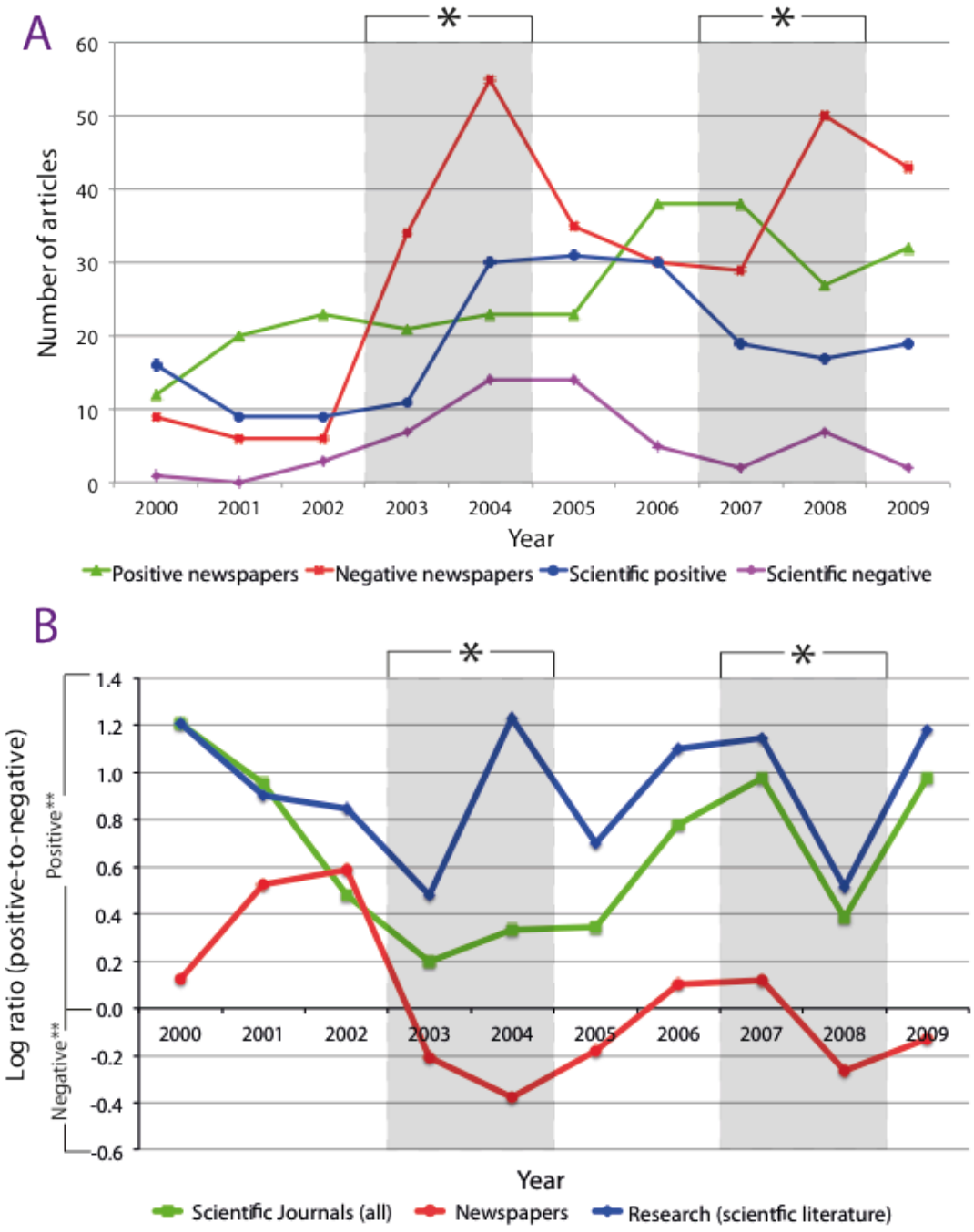


**Figure 2. (A) Effect messages (positive and negative) organized along the research period, per year (2000–2009) and according to the source (scientific-medical journals and newspapers). (B) The natural logarithm of the positive–to–negative ratio was calculated and also plotted for the accumulated scientific-medical articles (green line), accumulated newspaper articles (red line), and solely research articles from the scientific-medical literature (dark blue line). *The grey zone illustrates the period where most of the regulatory warnings were issued. **Articles with a positive–**

**effect trend are located above zero, whilst articles conveying a negative–effect trend are located underneath zero.**

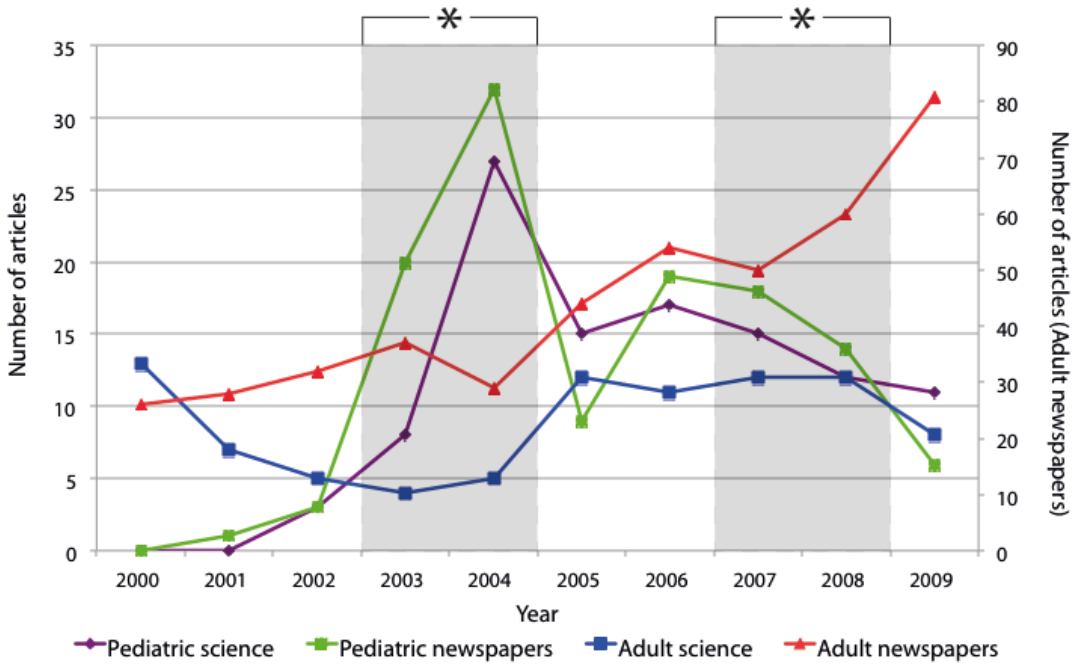


**Figure 3. Articles indexed into age groups (paediatric and adult) in scientific-medical journals and in newspapers from 2000 to 2009. The scale of newspaper articles on adults is portrayed on the right y-axis. *The grey zone illustrates the period where most of the regulatory warnings were issued.**

**Author's contributions:** All authors were involved in the design of the study, review of earlier versions of the manuscript, and providing final approval for submission. JFH was responsible for the collection, analysis (also statistical), and interpretation of the data, as well as drafting, and revising the manuscript. TP was responsible for the analysis and interpretation of the data, drafting supervision, and revision. SVB provided support with the statistical analyses, as well.

**Competing interests**: JAMR is part–time professor at the Utrecht University and vice–president external scientific collaborations for GSK in Europe, and holds stock in GSK. All other authors declare no personal conflict of interest relevant to

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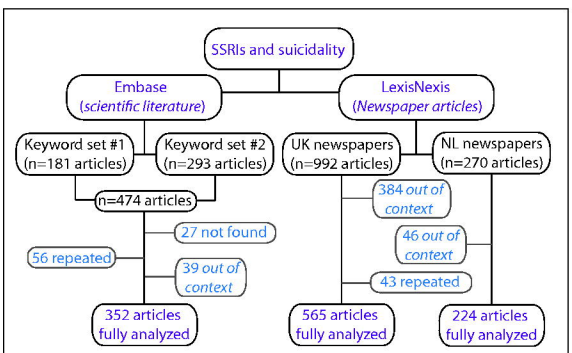
SSRIs and suicidality
Embase
(scientific literature)
LexisNexis
(Newspaper articles)
Keyword set #1
(n=181 articles)
Keyword set #2
(n=293 articles)
UK newspapers
(n=992 articles)
NL newspapers
(n=270 articles)
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56 repeated
39 out of context
43 repeated
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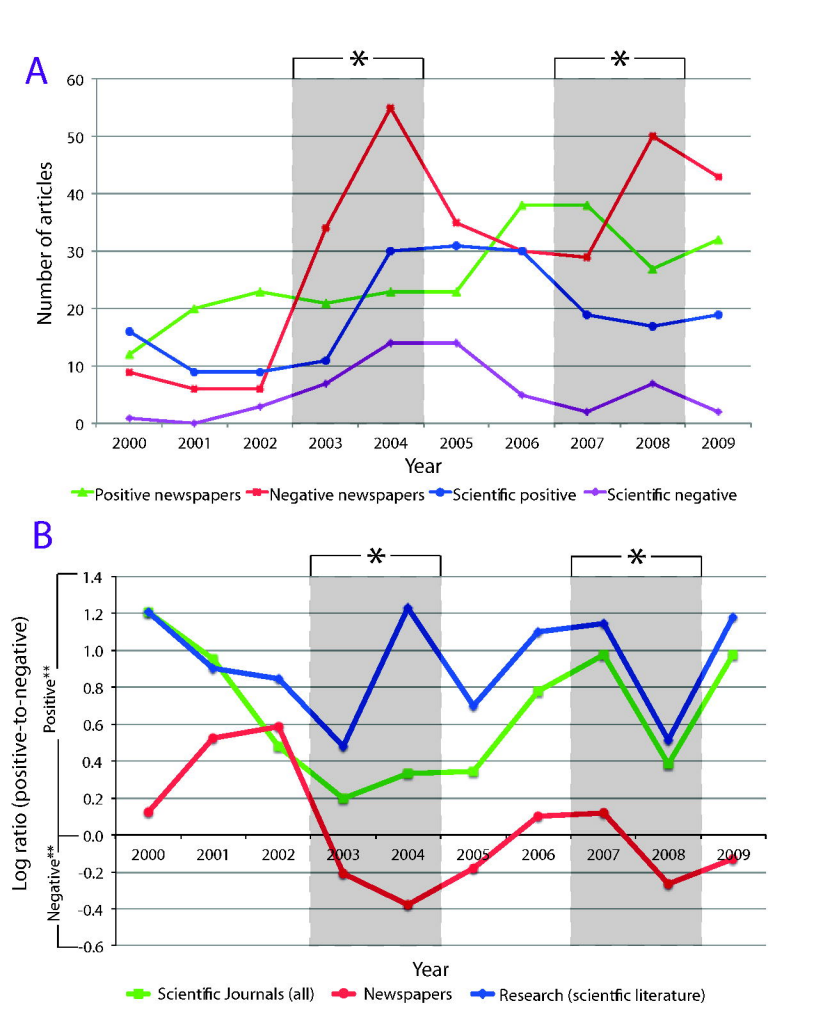
224 articles fully analyzed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Year
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Negative newspapers
Scientific positive
Scientific negative
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Positive**
Negative**
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1.2
1.0
0.8
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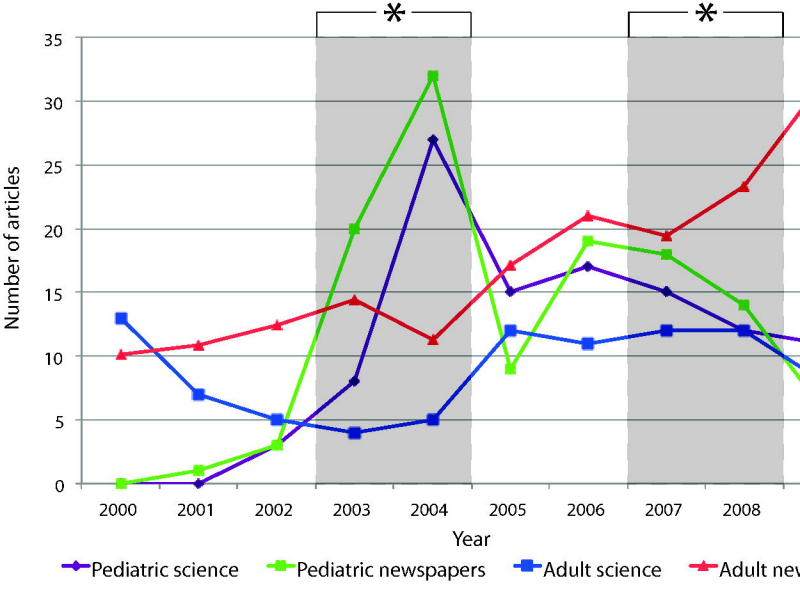
Newspapers
Research (scientfic literature)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Number of articles
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