# Does television reflect the evolution of scientific knowledge?

# The case of attention deficit hyperactivity disorder coverage on French TV.

Mélanie Bourdaa[1], Jan Pieter Konsman[2,3], Claire Sécail[4], Tommaso Venturini[5], Isabelle Veyrat-Masson[4] and Francois Gonon[6]

[1]MICA, University of Bordeaux 3, F-33607, Pessac, France

[2]Résonance Magnétique des Systèmes Biologiques, CNRS UMR 5536, University of Bordeaux, F-33076, Bordeaux, France

[3]Sciences, Philosophie, Humanités, EA 4574, University of Bordeaux 3, F-33607, Pessac, France

[4]Laboratoire Communication et Politiques, CNRS UPR 3255, F-75013, Paris, France

[5]Médialab, Sciences Politiques, F-75007, Paris, France

[6]Institut of Neurodegenerative Diseases, CNRS UMR 5293, University of Bordeaux, F-33076, Bordeaux, France

**Summary**

Biomedical findings mature from uncertain observations to validated facts. Although subsequent studies often refute initial appealing findings, newspapers privilege the latter and often fail to cover refutations. Thus, biomedical knowledge and media reporting may diverge with time. Here we investigated how French television reported on three scientific questions relative to attention deficit hyperactivity disorder (ADHD) from 1995 to 2010: i) is ADHD mainly genetic in origin, ii) does methylphenidate treatment decrease the risk of academic underachievement, and iii) are brain imaging techniques able to reveal ADHD in individual patients? Although scientific evidence regarding these questions has evolved during these 16 years, we observed that nine out of ten TV programs broadcast between 2007 and 2010 still expressed only opinions against the current scientific consensuses. The failure of TV programs to reflect the evolution of the scientific knowledge might be related to a biased selection of medical experts.

**Key words:** media and science, health and media, science experts, television, mental health, ADHD, medical expert

## Introduction

Until recently, studies on the media coverage of health science have examined the reporting accuracy of single scientific studies but have not investigated the media coverage of follow-up studies addressing the same issue (Bubela et al., 2009). Because scientific observations showing a positive effect are more often published than those reporting a null effect, initial findings are often refuted or attenuated by subsequent publications (Ioannidis, 2005; Ioannidis & Panagiotou, 2011). Because it may take several years to reach a scientific consensus (Shwed & Bearman, 2010), high quality media reporting of biomedical issues should consider a body of scientific studies, rather than merely initial publications. We recently showed, using the case of attention deficit hyperactivity disorder (ADHD), that newspapers widely report on initial findings, but much less so on follow-up studies and even fail to report on refutations (Gonon, Konsman, Cohen, & Boraud, 2012). We concluded that, regarding ADHD, while scientific knowledge matured from initial and uncertain observations to validated findings, newspapers did not report on this evolution.

As most studies on media reporting, our previous work only explored newspapers. Here we developed another approach to investigate the same question regarding TV reporting. This is a critical issue because television is the main source of information on medical sciences for Europeans (European Commission, 2007). Moreover, scientists and TV journalists do not share the same temporality. Therefore, we tested whether French TV programs followed the evolution of the scientific knowledge regarding ADHD from 1995 (launch of ADHD medication in France) to 2010. Because, in contrast to newspaper articles, TV programs rarely explicitly report on specific scientific publications, we used another approach more suitable for investigating the evolution of TV reporting. We selected three ADHD-related questions that were often discussed in TV programs: i) is ADHD mainly genetic in origin, ii) does methylphenidate treatment decrease the risk of academic underachievement, and iii) are brain imaging techniques able to reveal ADHD in individual patients? We selected these questions for two reasons. First, they are specific enough to be easily identified in TV programs. Second, they generated initial appealing scientific findings that were disconfirmed by a corpus of consistent subsequent scientific studies. Here we termed such a corpus "a consensus".

A detailed scientific discussion of these consensuses is available online (see Supplementary Text). Briefly, regarding the first question, although initial genetic studies in the 1990's described several genetic factors said to confer high risk to develop ADHD, subsequent studies either refuted or strongly attenuated them (Gonon et al., 2012). Sonuga-Barke (2010), a recognized leading scientist in the field wrote: "Now all but the most dogged of genetic determinists have revised their view of the primacy of genetic factors so as to encompass a central role of the environment in the development of ADHD". Likewise, because psychostimulants effectively enhanced attention in children, it was often claimed during the 1990's that this drug treatment protects ADHD children from academic underachievement. However, large studies in the 2000's showed that they do not (see discussion in (Gonon, 2009)). Finally, initial brain imaging studies during the 1990's described new methods to reveal ADHD, but all of these were subsequently refuted (Gonon et al., 2012). Up to now no brain imaging tests have been validated to diagnose ADHD.

## Methods

*Source of TV programs*

We analyzed all French broadcasts from analog TV that dealt with ADHD and/or Ritalin from 1995 till December 2010. We searched the database of the Institut National de l'Audiovisuel (http://inatheque.ina.fr/Ina/ws/dltv/dlweb/general/MultiSearchNames9), which indexes all the French TV documents, with the keyword Boolean search: ((hyperacti* OR ritaline) AND attention). TV programs that only mentioned "hyperactivity" as a behavior of healthy people were discarded. We obtained a corpus of 60 programs that included news, talk shows and debates (listed in supplementary Table S1). Although fictions are representative of the society and of its perception, fictions mentioning ADHD were not included. Instead, we were looking for TV programs in which opinions on ADHD were put forward by medical experts. TV programs that were broadcast several times were considered as a single TV program. However, when the same report was included as a component of two TV programs, we considered them as distinct programs.

*Coding of TV documents*

In a first phase, three authors (MB, CS and FG) watched the 60 TV programs. Documents that did not clearly address any of the three questions of interest were discarded and uncertain decisions about this sorting were discussed and resolved between these authors. We identified 33 TV programs providing an opinion regarding at least one of these three questions and we transcribed them.

In a second phase, two authors (MB and FG) independently read these transcriptions to code their opinions. For each of the three questions every media document was classified into one of 4 categories: 1) no opinion given about this particular question (NO), 2) the opinion agrees with the scientific consensus (A), 3) the opinion disagrees with the scientific consensus (D) and 4) the same document gives two opposite opinions (AD). Thus, 99 items (33 documents x 3 questions) were coded. Coding of expressed opinions was asserted by key sentences and their context. Uncertain coding decisions were discussed and resolved between both coders.

In the third phase the 33 transcriptions were numbered to remove any reference to the date and source and then entrusted to a fourth author (JPK), who was not involved in the first two phases. He independently coded the 99 items into four categories as indicated. Coding obtained by this fourth author was compared to that obtained in the second phase and the Cohen's kappa coefficients was calculated without weighting (Sim & Wright, 2005). We found a value of 0.86 that expresses a good inter-coder reliability (Lombard, Snyder-Duch, & Bracken, 2002). In the final phase the few disagreements between coders were discussed and resolved to establish a final classification that included 32 TV programs giving an opinion regarding at least one of these three questions (see supplementary Tables S1 to S4). These tables provide the key sentences upon which every judgment regarding the three questions was based. For each sentence we also noted the context (e.g. hospital, TV set) and the speaker. We distinguished journalists, medical experts, children and parents.

**Results**

*1st question: genetic etiology?*

We identified 16 TV programs expressing an opinion on the genetic etiology of ADHD (Supplementary Table S2). Among them, 11 programs asserted that genetic factors are the main cause of ADHD. In three of them, young boys said that "we were born this way" implicitly suggesting that genetic factors played a major role in their disease. In another

program a mother of an ADHD children said: "This is a disease. It is hereditary, my husband suffers from it". In six programs medical experts emphasized this genetic misconception. In 2004, 2008 and 2009 three experts indicated the high heritability of ADHD as evidence in favor of its genetic etiology (Table S2) although it has long been proven that a high heritability does not necessarily imply a genetic cause (Visscher, Hill, & Wray, 2008). Moreover, recent studies show that ADHD heritability is mainly due to gene-environment interactions (Ficks & Waldman, 2009; Sonuga-Barke, 2010). Likewise, another expert underlined that genes coding for molecular elements of dopamine transmission are associated with ADHD (Table S2) although the relevance of such associations was already questioned when this TV program was broadcast in 2002 (reviewed in Gonon, 2009). Among the six programs discussing this question since 2007, five defended an opinion opposite to the current scientific consensus (Table 1).

Only three programs provided an opinion in favor of the consensus and two programs provided both opposite opinions (Table S2). In the most recent one (2010), an expert started by saying that there is an obvious link between genes and ADHD, but thereafter, nuanced this statement by emphasizing that our modern way of life also plays an important role. In the second one the genetic point of view was expressed in a report, but afterwards, during a debate on set, another expert emphasized that, besides genes, environmental factors are also involved in ADHD.

*2nd question: does methylphenidate decrease the risk of academic underachievement?*

The effect of drug treatment on academic achievement of ADHD children is the most discussed question in French TV with 22 programs addressing this issue (Supplementary Table S3). Among them, eleven programs broadcast from 1995 to 2006 and five since 2007 overstated the benefit of medication regarding the academic achievement of ADHD children. In several programs, the visual context was particularly interesting. For example on August 2009 the first channel (a private one, with a large audience) showed Timothé a young teenager diagnosed with ADHD taking his pill in his kitchen. The journalist then followed him into his bedroom where Timothé showed sports trophies and then said to the camera: “Everything is better actually. I have caught up with three grades in one school year”. His image taking the pill and then saying that the drug treatment makes his school achievement much better is indeed quite suggestive.

Only 3 programs expressed both points of view (Table S3). They are long broadcasts (> one hour) presenting overviews on social and economical issues in the French society. The first program compared the ways in which ADHD was treated in the USA and in France. Interestingly, the dean of a USA primary school was the one giving an opinion in favor of the consensus, whereas French interviewees were totally enthusiastic about the beneficial effects of Ritalin regarding academic achievement. Finally, 3 programs only favored the scientific consensus (Table S3). They expressed reservations about the long-term effect of medication: "Ritalin is not the miracle medicine".

*3rd question: do brain imaging techniques reveal ADHD?*

We found 6 TV programs either asserting or implicitly suggesting that brain scans from an ADHD patient differ from those of a healthy individual (Supplementary Table S4). In one of these programs, broadcast in 2004, a specialized journalist explicitly said that brain scans from an ADHD child differ from that of a healthy child. The journalist, who seemed a

bit skeptical, insisted: "So, does brain imaging define ADHD?" The specialist answered: "Yes, brain imaging combined with parent interview and psychological tests." On the contrary just two TV programs acknowledged that "we have no biological marker that can reveal ADHD". Another program expressed both opposite opinions (Table S4).

Three TV programs broadcast in 2009 and 2010 showed the same pair of brain scans. The journalist said that one scan was recorded from an ADHD child and the other from a healthy one (Table S4). These scans were said to show the level of dopamine, which was said to be lower in the ADHD child. We have identified the source of these images as Fig.1 of the scientific article by Volkow et al. (2007). Actually, these images were recorded from adults not children, and showed the level of a radioligand ($^{11}$C-cocaine) labeling the dopamine transporter, which was lower in this particular ADHD adult. However, this scientific study showed that among 20 ADHD adults and 25 healthy adults the level of the dopamine transporter was highly variable (Volkow et al., 2007). On average no significant differences were observed between ADHD and controls in most brain areas. A modest decrease (13 %) with a low statistical significance ($p=0.04$) was observed in the left caudate of ADHD patients but not in the right (Volkow et al., 2007). Moreover, a decrease in the level of the dopamine transporter would result in an increase, not a decrease, of the dopamine level. Therefore, the journalist's comment widely misrepresented these scientific images. Because they were initially published in a specialized scientific journal, it is likely that the three medical experts who participated in these three programs had some degree of responsibility in their misrepresentation.

The 6 TV programs that claimed that ADHD can be revealed in individual children by brain imaging, also established a link between this alleged neurobiological difference and the effectiveness of psychostimulant treatment. Indeed, two types of argument were put forward. In the 3 most recent TV programs, which showed pairs of brain images said to prove a deficit in dopamine, this sequence was immediately followed by this type of statement: "Thus, drugs, which are used to treat ADHD, stimulate the secretion of neurotransmitters, such as dopamine". Although it is true that psychostimulants enhance dopamine signaling, the dopamine deficit theory of ADHD is scientifically weak (Gonon, 2009) as acknowledged in another, more balanced, TV program broadcast in 2003. The 3 other TV programs showed functional brain scans and commented on them by emphasizing lower activities in some brain areas of a child diagnosed with ADHD, compared to a healthy one, during an attention task. These comments were immediately followed by this type of statement: "Because ADHD is a neurobiological dysfunction, its treatment hinges on medication". In contrast, the previously mentioned more balanced TV program also showed similar functional brain images, but commented on them by saying that both medication and behavioral therapies might correct the neurobiological dysfunction. None of these programs mitigated their comments by saying that the brain images shown on set actually corresponded to the averaging of large groups of patients. Moreover, they did not acknowledge their complexity. The differences reported by functional brain imaging studies between groups of ADHD patients and controls are indeed complex: some brain regions seem less active while others are more active (Dickstein, Bannon, Castellanos, & Milham, 2006).

*Evolution of media opinions concerning scientific consensuses*

To appraise the evolution of opinions in TV programs during the 16-year period of our analysis, we counted together the opinions regarding all three consensuses (Table 1). The

opinions seem differently distributed between the first period (1995-1999) and the last three (2000-2010), but this comparison is open to criticism because we found only three relevant documents during the first period. A statistical analysis of the three last periods (1999 to 2010) shows that the opinion distribution remained markedly stable with time (chi2=2.91 Fisher's exact test: p=0.56) and always favored opinions disagreeing with the current consensuses (Table 1). Because several initial scientific studies published during the 1990's emphasized the involvement of genetic factor in ADHD etiology, the short-term beneficial effect of medication on school performance and the possible use of brain imaging for ADHD diagnosis, it is understandable that most French TV programs still defended these opinions during the early 2000's. Although the initial scientific opinions evolved during the late 1990's and early 2000's to reach the current consensuses, the recent TV programs did not follow this evolution: 13/15 of the opinions expressed during the 2007-2010 period disagreed with the current consensuses.

*Involvement of medical experts*

Among the 32 TV programs expressing at least one opinion, 24 gave only opinions disagreeing with the corresponding consensuses (D) whereas eight programs gave either consistent opinions (A) or both opposite opinions (AD) on the same question. No TV program presented one "A" opinion on one question, but a "D" opinion on another (Table S1). The 32 TV programs involved 59 expert participations from 41 distinct medical experts (Fig.1A). Five most popular experts participated in three to six programs. Four of these five experts have worked or are still working in the same department of the Robert Debré hospital in Paris. In contrast, 36 experts, who do not work in this hospital, only participated in one or two programs (Fig.1A). These five popular experts mostly participated in programs in which opinions disagreeing with the consensuses were expressed (Fig.1B). During the most recent period (2007-2010) nine programs expressed only opinions disagreeing with the consensuses and one program expressed consistent or balanced opinions (Table S1). The four popular experts of the aforementioned hospital only participated in the former (Fig.1C). Moreover, the three medical experts who participated in the three programs showing in 2009 and 2010 the same pair of misrepresented brain images, also worked in this hospital. Therefore, the fact that 9/10 of the recent TV programs do not reflect the evolution of the scientific knowledge may be related to the fact that they privilege a small group of medical experts from the same hospital. As previously analyzed (Lensing-Hebben, 2008), expert selection by French TV journalists seems mainly based on accessibility and personal relationships.

**Discussion**

Here we investigated how French TV echoed three scientific questions related to ADHD. We show that most recent TV programs did not follow the scientific evolution. A few previous studies on media reporting of biomedical science have investigated the accuracy of TV reporting. In line with our present observation they showed that "TV reports comprised a disproportionate number of the lowest scoring stories" (Condit, Ofulue, & Sheedy, 1998; Holtzman et al., 2005). Among the 16 TV programs that discussed the relative contribution of genetic versus environmental causes of ADHD, about two third erroneously favored its genetic etiology. This genetic trend remained markedly stable during the last 12 years whereas scientific knowledge evolved during the same period in favor of environmental causation. Previous analyses of newspaper articles have already pointed out this "genetic

optimism" and its time-stability regarding the causes of mental illness (Conrad, 2001). This biased reporting might affect public perception. Indeed, in the USA the belief that mental disorders are brain diseases of genetic origin increased from 57% in 1996 to 68% in 2006 (Pescosolido et al., 2010).

Previous studies showed that newspapers popularizing drug treatments and medical tests often emphasize benefits and effectiveness and do not mention limitations (Moynihan et al., 2000; Prosser, 2010; Schwitzer, 2008). Accordingly, we observed that numerous TV programs widely overstated the benefit of medication regarding the academic achievement of ADHD children. Indeed, French TV programs often pointed out obvious successes regarding drug treatment of ADHD children, but never showed the opposite, i.e. a child without academic improvement despite medication. Only one program out of 22 explicitly mentioned that, on average, medication does not decrease the risk of academic underachievement in the ADHD child populations. The causal link between drug treatment and positive academic outcome was reinforced by some TV programs showing implausible details: the assertion of a child's academic success was often immediately preceded by images showing the child taking his pill. Moreover, six TV programs erroneously suggested that brain imaging can be used to identify neurobiological abnormalities in an individual ADHD patient. The comments on these brain images were always followed by a statement claiming that psychostimulant treatment corrects the neurobiological dysfunction said to underlie ADHD. Therefore, most French TV programs overstated the benefit of drug treatment and, thus, may feed illusory hopes to ADHD patients and their families.

The fact that newspapers preferentially report on uncertain initial findings rather than on follow-up studies has been correlated with the fact that initial studies covered by newspapers were performed in more prestigious universities than the corresponding follow-up studies (Gonon et al., 2012). Likewise, we observed here that French TV journalists privilege a small group of expert from the same prestigious hospital. These observations suggest that a possible cause of inaccurate reporting might lie in the preferential relationships between journalists and a few medical experts. Further investigations are needed to explain these preferential relationships.

Because media reports of biomedical findings are often inaccurate, several authors have already made recommendations to improve health science reporting (Bubela et al., 2009; Ransohoff & Ransohoff, 2001). Here we investigate how TV journalists deal with the evolution of the scientific knowledge in time. In line with our previous analysis of newspaper coverage (Gonon et al., 2012), we observed that most French TV programs did not adequately follow the evolution of the scientific knowledge regarding ADHD. Because this reporting bias is likely to occur in all biomedical domains (Gonon et al., 2012), it represents a major concern in science reporting and journalists should be aware of it.

**References**


Bubela, T., Nisbet, M. C., Borchelt, R., Brunger, F., Critchley, C., Einsiedel, E., et al. (2009). Science communication reconsidered. *Nature Biotechnology,* 27: 514-518.

Condit, C. M., Ofulue, N., & Sheedy, K. M. (1998). Determinism and mass-media portrayals of genetics. *The American Journal of Human Genetics,* 62: 979-984.

Conrad, P. (2001). Genetic optimism: framing genes and mental illness in the news. *Culture, Medicine and Psychiatry,* 25: 225-247.

Dickstein, S. G., Bannon, K., Castellanos, F. X., & Milham, M. P. (2006). The neural correlates of attention deficit hyperactivity disorder: an ALE meta-analysis. *Journal of Child Psychology and Psychiatry,* 47: 1051-1062.

European Commission (2007) Medical & Health Research, Special Eurobarometer 265.

Ficks, C. A., & Waldman, I. D. (2009). Gene-environment interactions in attention-deficit/hyperactivity disorder. *Current Psychiatry Report,* 11: 387-392.

Gonon, F. (2009). The dopaminergic hypothesis of attention-deficit/hyperactivity disorder needs re-examining. *Trends in Neuroscience,* 32: 2-8.

Gonon, F., Konsman, J. P., Cohen, D., & Boraud, T. (2012). Why most biomedical findings echoed by newspapers turn out to be false: the case of Attention Deficit Hyperactivity Disorder. *PLoS ONE,* 7: e44275.

Holtzman, N. A., Bernhardt, B. A., Mountcastle-Shah, E., Rodgers, J. E., Tambor, E., & Geller, G. (2005). The quality of media reports on discoveries related to human genetic diseases. *Community Genetics,* 8: 133-144.

Ioannidis, J. P. (2005). Contradicted and initially stronger effects in highly cited clinical research. *JAMA,* 294: 218-228.

Ioannidis, J. P., & Panagiotou, O. A. (2011). Comparison of effect sizes associated with biomarkers reported in highly cited individual articles and in subsequent meta-analyses. *JAMA,* 305: 2200-2210.

Lensing-Hebben, C. (2008). *Les experts cathodiques: chercheurs face à la tentation médiatique.* Lormont, France: Le bord de l'eau.

Lombard, M., Snyder-Duch, J., & Bracken, C. C. (2002). Content analysis in mass communication:assesment and reporting or intercoder reliability. *Human Communication Research,* 28: 587-604.

Moynihan, R., Bero, L., Ross-Degnan, D., Henry, D., Lee, K., Watkins, J., et al. (2000). Coverage by the news media of the benefits and risks of medications. *New England Journal of Medicine,* 342: 1645-1650.

Pescosolido, B. A., Martin, J. K., Long, J. S., Medina, T. R., Phelan, J. C., & Link, B. G. (2010). "A disease like any other"? A decade of change in public reactions to schizophrenia, depression, and alcohol dependence. *Am J Psychiatry,* 167: 1321-1330.

Prosser, H. (2010). Marvelous medicines and dangerous drugs: the representation of prescription medicine in the UK newsprint media. *Public Understanding of Science.,* 19: 52-69.

Ransohoff, D. F., & Ransohoff, R. M. (2001). Sensationalism in the media: when scientists and journalists may be complicit collaborators. *Effective Clinical Practice,* 4: 185-188.

Schwitzer, G. (2008). How do US journalists cover treatments, tests, products, and procedures? An evaluation of 500 stories. *PLoS Medicine,* 5: e95.

Shwed, U., & Bearman, P. S. (2010). The temporal structure of scientific consensus formation. *American Sociological Review,* 75: 817-841.

Sim, J., & Wright, C. C. (2005). The kappa statistic in reliability studies: use, interpretation, and sample size requirements. *Physical Therapy,* 85: 257-268.

Sonuga-Barke, E. J. (2010). Editorial: 'It's the environment stupid!' On epigenetics, programming and plasticity in child mental health. *Journal of Child Psychology and Psychiatry,* 51: 113-115.

Visscher, P. M., Hill, W. G., & Wray, N. R. (2008). Heritability in the genomics era--concepts and misconceptions. *Nature Reviews Genetics,* 9: 255-266.

Volkow, N. D., Wang, G. J., Newcorn, J., Fowler, J. S., Telang, F., Solanto, M. V., et al. (2007). Brain dopamine transporter levels in treatment and drug naive adults with ADHD. *Neuroimage,* 34: 1182-1190.

**Table 1.** Time evolution of the number of TV programs expressing an opinion against or in favor of the 3 scientific consensuses.

| **Time period (year)** | 1995-1998 | 1999-2002 | 2003-2006 | 2007-2010 |
|---|---|---|---|---|
| **First consensus: genetic factors are not the main cause of ADHD** | | | | |
| Expressing opinion against the consensus | 0 | 2 | 4 | 5 |
| Expressing both opinions | 0 | 0 | 1 | 1 |
| Expressing opinion in favor of the consensus | 1 | 1 | 1 | 0 |
| **Second consensus: medication does no decrease the risk of academic underachievement** | | | | |
| Expressing opinion against the consensus | 1 | 3 | 7 | 5 |
| Expressing both opinions | 0 | 2 | 1 | 0 |
| Expressing opinion in favor of the consensus | 1 | 0 | 1 | 1 |
| **Third consensus: no brain imaging test can help ADHD diagnosis** | | | | |
| Expressing opinion against the consensus | 0 | 0 | 3 | 3 |
| Expressing both opinions | 0 | 0 | 1 | 0 |
| Expressing opinion in favor of the consensus | 0 | 0 | 2 | 0 |
| **Cumulative data considering all 3 consensuses** | | | | |
| Expressing opinion against any consensus | 1 | 5 | 14 | 13 |
| Expressing both opinions regarding any consensus | 0 | 2 | 3 | 1 |
| Expressing opinion in favor of any consensus | 2 | 1 | 4 | 1 |
| Ratio: number of TV programs expressing opinions against consensuses / total number of opinions. | 1/3 33% | 5/8 62% | 14/21 67% | 13/15 87% |

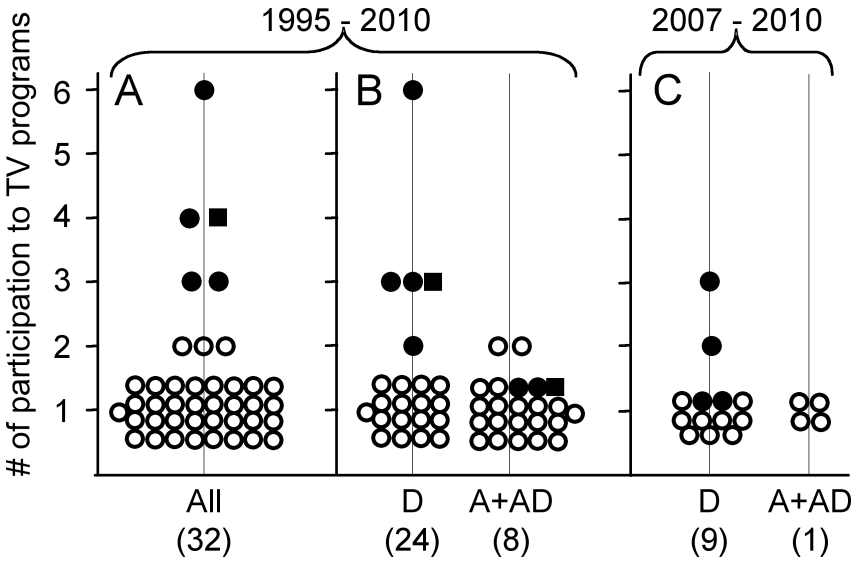


**Figure 1:** Involvement of medical experts in TV programs. **A:** All 32 TV programs providing at least one opinion about the three questions were considered together. They involved 59 expert participations from 41 distinct experts. The five most popular experts (black symbols) participated in 3 to 6 programs. Four of them have worked or are still working in the same hospital department in Paris (black circles). In contrast, 36 experts participated in one or two programs (empty circles). **B:** Among the 32 TV programs, 24 gave only opinions disagreeing with the corresponding consensuses (D) whereas eight programs gave either consistent opinions (A) or both opposite opinions (AD) on the same question. The five most popular experts mostly participated in the 24 former programs (D) although three of them also participated one time in the latter (A+AD). Indeed, the participation distributions of the five most popular experts and those of other experts to the 24 D programs and to the 8 A+AD programs are not independent (chi2=9.28 p=0.002). **C:** Same analysis restricted to the most recent period (2007-2010). The four experts of the same hospital (black circles) only participated in the nine TV programs defending only opinions disagreeing with the scientific consensuses.