Les Méta-analyses

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CFMT

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En fait….

Les Méta-analyses de Rune Elvik

Sources (Accident Analysis and Prevention)

- The safety value of **guardrails and crash cushions**: a meta-analysis of evidence from evaluation studies, 1995
- A meta-analysis of studies concerning the safety effects of **daytime running lights** on cars, 1996
- Evaluating the **statistical conclusion validity of weighted mean** results in meta-analysis by anlysing funnel graph diagrams, 1998
- The effects on accidents of **studded tires and laws banning their use**: a meta-analysis of evalauation studies, 1999
- **Area-wide urban traffic calming** schemes: a meta-analysis of safety effects
- Publication bias and time-trend bias in meta-analysis of **bicycle helmet** efficacy: a **re-analysis** of Attewell, Glase and McFadee 2001, 2011
- Risk of road accident associated with the **use of drugs**: a systematic review and meta-analysis of evidence from epidemiological studies, 2013
- Association between **increase in fixed penalties and road safety outcomes**: a meta-analysis, 2016
- Road safety of **roundabouts:** a meta-analysis, 2017

C’est quoi, une méta-analyse?

La méta-analyse est une analyse systématique qui compile et synthétise les résultats de différentes études

Etapes d'une méta-analyse

- Définition du sujet et de l'objet de l'analyse
- Revue systématique de la littérature
  - Scan des journaux scientifiques
  - Recherche des papiers référencés dans les papiers 'primaires'
  - Construction d'un tableau résumé des études et des estimations
  - Publication de ce tableau dans la méta-analyse
- Test de la qualité des études
- Test du biais de publication: le funnel graph (Light and Pillemer, 1984)
- Technique statistique de méta-analyse (e.g. logodds, Fleiss, 1981)
- Résultats

Un Exemple

Contents lists available at ScienceDirect

Accident Analysis and Prevention

journal homepage: www.elsevier.com/locate/aap

Risk of road accident associated with the use of drugs: A systematic review and meta-analysis of evidence from epidemiological studies

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Un Exemple

- Bien définir le sujet et l'objet de l'analyse

The aim of this paper is to summarize current knowledge regarding the risks associated with the use of drugs while driving. The paper seeks to improve previous reviews by: (1) including as many drugs as possible in the systematic literature review and meta-analysis; (2) assessing study quality and testing how it influences study findings; (3) testing and adjusting for the possible presence of publication bias. Alcohol is not included in this study. The focus is on drugs used in regular medical treatment or illicit drugs used recreationally.

Un Exemple

- Bien définir le sujet et l'objet de l'analyse

Drugs assessed 	Main types: (1) Amphetamines; (2) Analgesics; (3) Anti-asthmatics; (4) Anti-depressives; (5) Anti-histamines; (6) Benzodiazepines (including barbiturates and diazepam); (7) Cannabis (including marijuana); (8) Cocaine; (9) Opiates (including morphine); (10) Zopiclone; (11) Penicillin; (12) Miscellaneous other drugs (very many)

Un Exemple

Table 2
Studies included in meta-analysis.

Study number	Authors	Year	Country	Design	Drugs assessed (see Table 1)	Accident severity	Estimator of risk	Measure of drug use	Confounders controlled (see Table 1)	Dose-response assessed	Dose-response found
1	Smart, Fejer	1976	Canada	Sample survey	1-6-7-9-12	Mostly PDO	Odds ratio	Self report	A	No	No
2	Skegg et al.	1979	Great Britain	Case–control	2-3-5-11-12	Serious injury	Odds ratio	Prescriptions	AGR	No	No
3	Honkanen et al.	1980	Finland	Case–control	2-6-12	Injury	Odds ratio	Self report	None	No	No
4	Jick et al.	1981	United States	Culpability	5-6	Injury	Odds ratio	Prescriptions	None	No	No
5	Hingson et al.	1982	United States	Sample survey	7	Mostly PDO	Odds ratio	Self report	AEGJM	Yes	Yes
6	Terhune	1983	United States	Culpability	7	Mostly PDO	Odds ratio	Lab analysis	None	No	No
7	Williams et al.	1985	United States	Culpability	7	Fatal	Odds ratio	Lab analysis	None	No	No
8	Oster et al.	1987	United States	Cohort	6	Injury	Odds ratio	Prescriptions	ADGQ	No	No
9	Oster et al.	1990	United States	Cohort	6	Injury	Relative risk	Prescriptions	ADG	Yes	Yes
10	Ray et al.	1992	United States	Cohort (retro)	4-6	Injury	Relative risk	Prescriptions	AGPRY	Yes	Yes
11	Terhune et al.	1992	United States	Culpability	1-6-7-8	Fatal	Odds ratio	Lab analysis	None	No	No
12	Benzo group	1993	France	Culpability	6	Injury	Odds ratio	Lab analysis	J	No	No
13	Leveille et al.	1994	United States	Case–control	2-4-5-6	Injury	Odds ratio	Prescriptions	AEGIMOP	Yes	Yes
14	Currie et al.	1995	Great Britain	Culpability	4-6	Injury	Odds ratio	Lab analysis	None	No	No
15	Drummer	1995	Australia	Culpability	1-6-7-9-12	Fatal	Odds ratio	Lab analysis	AG	No	No
16	Neutel	1995	Canada	Cohort (pros)	6	Injury	Odds ratio	Prescriptions	L	Yes	Yes
17	Hemmelgarn et al.	1997	Canada	Case–control	6	Injury	Odds ratio	Prescriptions	ADGIR	Yes	Yes
18	Barbone et al.	1998	Great Britain	Case-crossover	4-6-10-12	Injury, PDO	Odds ratio	Prescriptions	AEGIMOPR	Yes	Yes
19	Neutel	1998	Canada	Cohort	4-6	Injury	Odds ratio	Prescriptions	ADG	No	No
20	Longo et al.	2000	Australia	Culpability	6-7	Injury	Odds ratio	Lab analysis	None	Yes	Yes
21	McGwin et al.	2000	United States	Case–control	4-10	Mostly PDO	Odds ratio	Self report	AGMP	No	No
22	Swann	2000	Australia	Culpability	7	Fatal	Odds ratio	Lab analysis	None	No	No
23	Fergusson	2001	New Zealand	Sample survey	7	Mostly PDO	Odds ratio	Self report	ABGMVX	Yes	Yes
24	Lowenstein	2001	United States	Culpability	7	Injury	Odds ratio	Lab analysis	None	No	No
25	Chipman et al.	2002	Canada	Case–control	7-8	Mostly PDO	Relative risk	Self report	AGDX	No	No
26	Dussault et al.	2002	Canada	Case–control	1-6-7-8-9	Fatal	Odds ratio	Lab analysis	Not clear	No	No
27	Gerberich et al.	2003	United States	Sample survey	7	Serious injury	Relative risk	Self report	ACEFGIJO	Yes	Yes
28	Mura et al.	2003	France	Case–control	6-7-9	Injury	Odds ratio	Lab analysis	AG	No	No
29	Wadsworth et al.	2003	Great Britain	Sample survey	4	Injury	Odds ratio	Self report	ACGIJOQW	No	No
30	Brault et al.	2004	Canada	Case–control	1-6-7-8-9	Fatal	Odds ratio	Lab analysis	AGTW	No	No
31	Drummer et al.	2004	Australia	Culpability	1-6-7-9	Fatal	Odds ratio	Lab analysis	ADGJKR	Yes	Yes
32	Etminam et al.	2004	Canada	Case–control	4	Injury	Odds ratio	Prescriptions	ADGIRW	Yes	Yes
33	Movig et al.	2004	Netherlands	Case–control	1-6-7-8-9	Injury	Odds ratio	Lab analysis	ADGJTY	No	No

Un Exemple

- Evaluation de la qualité Revue systématique de la littérature
  - Mesure du ‘drug use’
  - Mesure de la gravité de l’accident
  - Contrôle des facteurs de confusion
  - Présence d’une relation dose-effet

Un Exemple

- Estimation

3. Meta-analysis

3.1. Study inclusion criteria and statistical weighting

Estimates of the risk of accident involvement associated with the use of drugs were included in the meta-analysis if the standard error of the estimate was stated or could be derived. Each estimate of risk was assigned a statistical weight which was inversely proportional to its sampling variance (standard error squared). Most estimates of risk were odds ratios, which were converted to log odds ratios in order to apply the normal distribution for statistical testing and estimation of confidence intervals. The statistical weight assigned to each estimate of risk was defined as follows:

$$w_i = \frac{1}{v_i}$$

Variance of logarithm of odds ratio : $v_i = \frac{1}{A} + \frac{1}{B} + \frac{1}{C} + \frac{1}{D}$

Un Exemple

- Test du biais de publication : Le Funnel Graph

Fig. 2. Funnel plot of all estimates of relative risk associated with the use of drugs while driving.

Résultats

Sujet	Nb	Estimation	Commentaires
Guardrails and crash cushions	32	Baisse du taux d'accident et de leur gravité	-Incertitude pour les taux (faiblesse méthodologique des études). -Robustesse pour la gravité
Daytime running lights	17	-Moins 10-15 % des 'multi-party' accidents de jour. -Entre moins 2% et 10 % pour la réglementation	-effet sur les taux d'accidents des véhicules avec DRL -effet de l'introduction d'une réglementation
Studded tires and laws banning their use	11	- Dépend de la qualité des études. – 5% sur neige ou glace	-effet sur les taux d'accidents des véhicules avec pneus cloutés -effet de l'introduction d'une réglementation
Traffic Calming	33	Baisse des accidents corporels de 15 %	- -25% dans les quartiers résidentiels - - 10 % sur les routes principales

Résultats

Sujet	Nb	Estimation	Commentaires
Porous asphalt	6	Pas d'effet clair	Amplitude faible et résultats peu significatifs statistiquement
Bicycle helmet (re-analysisng)	13 (est)	Baisse autour de 50 % des risques de blessures à la face et à la tête (« brain »)	-Revisite d'une précédente étude considérée comme affectée par un biais de publication - Efficacité plus faible que les estimations initiales
Use of drugs	66	-Faible augmentation du risque d'accident	-Amphétamines, analgésique, anti asthmatique, anti dépresseurs, anti histaminique, benzodiazépine, cannabis, cocaïne, opiacés, pénicilline, zoplicone -Imprécision sur l'usage et la dose mais certaines études confirment la relation dose-effet -Qualité variable des études
Increase in fixed penalties and safety outcomes	9 (inf.) 4 (acc.)	- Baisse légère du taux d'infraction - Entre 1 et 12% de baisse des taux d'accidents	
Converting junctions to Roundabouts	44	Baisse des accidents mortels de 65 % et des accidents corporels de 40 %	Faible tendance au biais de publication

Merci de votre attention!