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Adequacy of Routinely Collected Data for the Assessment of the Reproductive Health of a Community Living in the Neighbourhood of Two Household Refuse Incinerators: a Critical Case Study

by

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Abstract

Background: *Given repeated complaints of the occurrence of congenital anomalies in the neighbourhood of two waste incinerators, closed for their violation of the emission norms, the authorities decided to condition the resumption of the activities on the results of a study of*

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the possible harmful effects of the emissions on the reproductive health in the neighbourhood. As the local population felt reluctant to participate in that study, we had to rely exclusively on routinely collected data.

Methods: *Observational study regarding Neerland, an area in the conurbation of Antwerp (Belgium), with an ecological and a retrospective cohort component, combining data of several medical and public databases. In a database of all children, born in Flanders (Northern Belgium) in the years 1989-1996 (N= 506,632), a group of 636 children, whose mothers were residents of the neighbourhood at any point in time, was identified and compared with the overall population.*

Results: *The comparison with the overall population did not reveal, multiplets excepted (odds ratio (OR) 2.04, 95% confidence interval (CI) 1.33 - 4.76), a significant excess of congenital anomalies (OR 1.20, 95% CI 0.69- 2.08), perinatal mortality, low birth weight, short gestational duration, diminished parity, or a reversal of the sex ratio. However, within the group of Neerland children a significant negative relationship between duration of exposure of the mother and congenital anomalies (OR 0.78, 95% CI 0.60-0.95) was found.*

Conclusion: *Notwithstanding the obvious limitations of the study and although an excess of congenital anomalies could not be confirmed nor excluded, the findings regarding reproductive health seemed not to suggest the occurrence of major health threats.*

Keywords: *household refuse incinerator, routinely collected data, reproductive health, environmental surveillance, risk perception and communication.*

Introduction

Public concern about potential health risks related to environmental pollution is great, especially when the pollution site is nearby. (1-8) Thus, in the years preceding this study the inhabitants of Neerland, an area in the conurbation of Antwerp, Belgium, have repeatedly reported the occurrence of cases of congenital anomalies to the authorities, to no effect. They blamed these anomalies on the dioxin emissions from two household refuse incinerators in the vicinity, at less than two kilometres distance from each other.

At the time of the study, the first incinerator, situated in the southeast of Neerland, was closed definitively and the second one situated in the southwest of Neerland, was closed provisionally for exceeding the

prevailing emission norms regarding dioxins (9). On the basis of the quantities of burnt waste and the type of filtration of the emission gases, the mass-flow of both incinerators has been computed from their start-up. Next, the deposition of dioxins in the neighbourhood has been computed and compared with dioxin concentrations in soil samples, taken in the surroundings of the incinerators. It not only appeared that the computed soil contamination was lower than the measured one, but also that their deposition patterns were rather different, indicating the presence of other important sources of dioxin exposure. The area of maximum exposure to emissions of the temporarily closed incinerator corresponds to the area of Neerland, which is situated between 1 and 2 kilometres to the northeast, the leeward side of the incinerator.

Alarming reports concerning congenital anomalies and increasing pressure from the local population and the media elicited the decision of the political authorities to make the resumption of the activities of the incinerator dependent on both respect for the emission norms and on an assessment of the reproductive health status.

The study had to address a whole range of possible adverse health effects related to the pollutants and their putative sources.

Dioxins and related compounds have been associated with congenital anomalies, immunological disturbances, reversal of the sex ratio, cancer, delayed growth, endocrine effects and neurobehavioural disturbances (10-26).

Earlier studies have revealed that the health risks due to emissions from incinerators are both insignificant compared to other background sources and extremely small, provided that the facilities are well designed and operated (11,27,28). Possible health effects may encompass phenomena such as the occurrence of multiple births (29,30), disturbances of fertility (31) and childhood cancer (32,33).

Due to a political decision the study had to be carried out in only three months. As the local population felt reluctant to participate, it appeared impossible to conduct a classical epidemiological study such as a case-control study (34,35). Thus, relying exclusively on routinely collected data of several medical and public databases of varying degrees of usefulness (36-39), we had to identify and to combine relevant pieces of information into sufficiently convincing evidence as to allow for a sensible answer to this environmental problem.

The main policy making question was whether there were sufficient public health related arguments to allow the resumption of activities of

the temporarily closed waste incinerator. Scientific arguments can be derived from (1) the literature, (2) a study based on existing sources of information, (3) an entirely newly designed study. We have opted for a combination of (1) and (2), since (3) would imply an unacceptably long study time in the given circumstances. The precise definition of the research questions as well as the study design are described in the next section.

Methods

Endpoints of the study

As the adverse health effects of incinerators may go beyond the problem of congenital anomalies, several other endpoints of reproductive health were included in the study: spontaneous and medically induced abortions, perinatal mortality, low birth weight, short pregnancy duration, less favourable maternal age, reduced parity, reversal of sex ratio, excess of multiple births, and excess of medically assisted initiations of pregnancy.

Data collection

Medical and public databases, made available by public as well as private bodies were used. From the municipal register of Antwerp we received two files for the period of 1989 up to 1997. First, a file of all children born in the Antwerp conurbation, whose mothers had been a resident of Neerland at any point in time. The data included gender, date of birth, mother's date of birth and National Register number. Second, a file of all women resident of Neerland at any time, including date of birth, National Register number, the date of entry into a particular domicile with its street address, and the date of departure (if applicable). The National Register provided the list of offspring of these mothers, enabling the identification of children born outside of the Antwerp conurbation.

The Centre for the Study of Perinatal Epidemiology (SPE) provided a file of 506,632 births for the period 1989 up to 1996. Since 1989 this centre has recorded more than 90% of all Flemish live births as well as all stillbirths (of foetuses weighing at least 500g) and neonatal deaths. The data included the date of birth of mother and child, gestational age, birth weight, gender, occurrence of multiple pregnancy and birth order of the child, anonymous hospital number, residence of the mother, occurrence and type of congenital anomaly. From 1991 onwards, parity and method of initiation of the pregnancy were registered as well.

Date of birth of mother and child, residence of the mother and birth order in cases of multiple births were used as unique identifiers to link the SPE file with the Neerland files by match merging techniques (40). The merged database enabled the identification of a group of 636 children whose mothers were once a resident of Neerland.

The 1991 national census and the fiscal income statistics provided a rough approximation of the socio-economic status (SES) of Neerland, which was higher than in Flanders as a whole. Finally, to be able to adjust for SES in our analysis regarding resident mothers, we merged the subset of 636 children with the official birth files for 1989 to 1996, enabling the completion of their records with the occupational group of both parents, used as a proxy for SES.

Design

Having to rely on registered data, without details of exposure at the individual level in the reference population, we had to set up a post hoc small-area study. Due to data availability, the study had to be restricted to the period of 1 January 1989 up to 31 December 1996. However, having the complete addresses and exact durations of residence of the Neerland population, a retrospective cohort study with respect to the reproductive health was carried out, taking the duration of residence as a proxy of exposure.

Three layers of comparisons involving reproductive health were made.

The first concerned the relative frequency of pregnancy-related problems in the Neerland population compared to the rest of Flanders. These endpoints are mostly unambiguous. Congenital anomalies, however, are neither uniformly diagnosed nor registered, limiting the possibilities of comparison to the occurrence frequency of congenital anomalies in each group.

Secondly, since in the comparison with Flanders a number of gynaecologists are involved, which may introduce inter-observer variability, we compared the occurrence of congenital anomalies in newborns of mothers resident in Neerland at any point in time, and of non-resident mothers delivering in the same obstetrical units.

Thirdly, within the group of resident mothers, the occurrence of congenital anomalies was analysed in relation to following explanatory variables: maternal age (dichotomised into less than 35 years and otherwise), occupational group of the parents, multiple births, gender,

total duration of residence and duration of residence in the ten years preceding birth, calendar year and time interval between date of departure and birth. The duration of residence was used as a proxy of exposure. A positive dose-response relationship would indicate an etiologic contribution of the incinerators in the occurrence of anomalies (41-44).

It ought to be understood that this exposure variable is a proxy for the actual exposure one might like to use, but which is beyond reach. Arguably, the best one can do is use the best possible proxy rather than aim for the true exposure status. Evidently, this implies due caution when interpreting the study findings.

For women immigrating into Neerland, the date of entry in the municipal register was considered the starting point of the duration of residence. For women with multiple episodes of immigration and emigration a global duration of residence was computed. Since Neerland is an area of intense moving, in terms of internal migration as well, it is impossible to determine the exact location of its inhabitants with respect to the incinerators.

Statistical aspects

Maternal age, birth weight and gestational age, characterised by a non-linear association with the perinatal endpoints under study, were categorized (45).

Regarding nominal multinomial variables the likelihood ratio test and, when indicated, Fisher's exact test were used to test differences between proportions. In case of interval variables the Cochran-Armitage trend was used (46).

Odds ratios and 95% confidence intervals are given for binomial variables (47). They are reported as follows: OR (LB, UB).

For the multiple-variable analyses we made use of dichotomous logistic regression in case of a binomial response variable whereas in case of multinomial responses we used generalised logit modelling (Baseline category) (46). The models were formulated a priori, based on scientific insight. As our interest was focused on a possible influence of place of residence on the endpoints under consideration, our modelling remained restricted to the achievement of a good fit and to the assessment whether or not place of residence reached significance. In such case odds ratios and their confidence intervals were to be provided.

Results

Comparison between Neerland and the rest of Flanders

While the adjusted odds ratios are more important than the crude ones, we believe it is good practice to report both in a study conducted, at least in part, because of public concern. Point estimates and 95% confidence intervals, showing the magnitude of evidence, are displayed in Table 1. The odds ratios of perinatal mortality ($p=0.089$) and congenital anomalies ($p=0.414$) are not significant. Perinatal mortality, if anything, might be less important in the Neerland group.

Regarding the congenital anomalies our analysis showed a power of only 0.20 (48,49). One would have needed 122 cases out of 5847 births to achieve significance with a power of 0.80. In addition, we found an important and significant excess of multiples in Neerland (Table 1). On the contrary, maternal age, gestational age, birth weight, the proportion of boys among the newborns, an equivalent for the sex ratio, the parity in mothers of singletons and the age distribution of primiparous mothers (not shown) seem to be similarly distributed (Tables 1 and 2). The point estimates, 95% confidence intervals and probabilities of the multivariable analysis are displayed in Tables 3 and 4. They essentially convey the same information as the univariate analyses regarding perinatal mortality, sex ratio, congenital anomalies or multiples. Medically assisted initiation of pregnancy in singletons was comparable in both groups. Conversely, there were significantly more medically assisted initiations of pregnancy in mothers of multiples in Neerland (Table 3) but gestational age, birth weight and parity in singletons were quite similarly distributed (Table 4).

Occurrence of congenital anomalies in resident and non-resident mothers delivering in the same obstetrical units

578 of the 636 babies from resident mothers were born in 12 obstetrical units and are compared with the 83,474 others, born in the same obstetrical units. 12 cases of congenital anomalies were observed amongst the Neerland children versus 1297 cases amongst the other children, corresponding to a non-significant odds ratio of 1.34 (0.72; 2.44) and almost identical with the one we observed in our comparison with the rest of Flanders.

A multivariate analysis, correcting for maternal age, gender and multiple pregnancy, resulted in an odds ratio of 1.29 (0.73; 2.23), also non-significant.

TABLE 1.
Distribution of binary endpoints of reproductive health by residence of the mother,
Flanders, 1989-1996

	Neerland	Flanders	Odds Ratio (95% CI) Neerland vs rest of Flanders
Perinatal death	1/636	4344/505996	0.18 (0.03;1.29)
Congenital anomaly	13/636	8259/505996	1.26 (0.73;2.18)
Multiplets	55/636	17601/505996	2.62 (1.99;3.47)
Boys	340/636	259629/505996	1.09 (0.93;1.27)

TABLE 2.
Distribution of multi-category endpoints of reproductive health
by residence of the mother, Flanders, 1989-1996

	Neerland		Rest of Flanders	
	N	%	N	%
Maternal age (in completed years)				
< 20 years	9	1.42	10605	2.10
20-34 years	580	91.19	461432	91.19
> 34 years	47	7.39	33959	6.71
Total	636	100.00	505996	100.00
Likelihood ratio chi-square: p=0.366				
Birth weight (singletons)				
< 1500 g	3	0.52	3506	0.72
1500-2499 g	19	3.27	19527	4.00
>= 2500 g	559	96.21	465362	95.28
Total	581	100.00	488395	100.00
Likelihood ratio chi-square: p=0.539				
Gestational age (singletons)				
< 32 weeks	3	0.52	3582	0.73
32-36 weeks	28	4.82	20707	4.24
>= 37 weeks	550	94.66	464106	95.03
Total	581	100.00	488395	100.00
Likelihood ratio chi-square: p=0.649				
Parity (singletons)				
1	226	45.29	179989	45.84
2	173	34.67	136272	34.71
3	72	14.43	51078	13.01
4	17	3.41	15639	3.98
5+	11	2.20	9658	2.46
Total	499	100.00	392636	100.00
Likelihood ratio chi-square: p=0.926; Cochran-Armitage trend test (two-tailed): p=0.995				

TABLE 3.
Endpoints of reproductive health by residence of the mother.
Results of logistic regression, Flanders, 1989-1996

Endpoint	Corrected for	Goodness-of-fit (Deviance)			Residence		Odds Ratio (95% CI) Neerland vs Rest of Flanders
		Df	Value	Prob.	Df	Chi ²	
Perinatal Mortality	M, G, A, C, B	58	58.52	0.456	1	3.173	0.16 (0.01; 1.77)
Gender	M, A, C	14	13.07	0.521	1	1.167	1.09 (0.91; 1.31)
Multiplets	A, G	5	5.511	0.357	1	26.04	2.25 (1.65; 3.07)
Congenital Anomaly	M, G, A, D	16	9.471	0.893	1	0.430	1.20 (0.69, 2.08)
Medically Assisted Initiation of Pregnancy	A						
- Singletons		2	1.536	0.463	1	2.490	2.04 (0.71; 5.82)
- Multiplets		1	0.031	0.860	1	8.045	2.50 (1.16; 5.38)

Corrected for: M: multiplets, G: gender, A: maternal age, C: congenital anomaly, D: gestational duration, B: birth weight

TABLE 4.
 Endpoints of reproductive health by residence of the mother.
 Results of modelling baseline-category logits, Neerland versus Flanders, 1989-1996

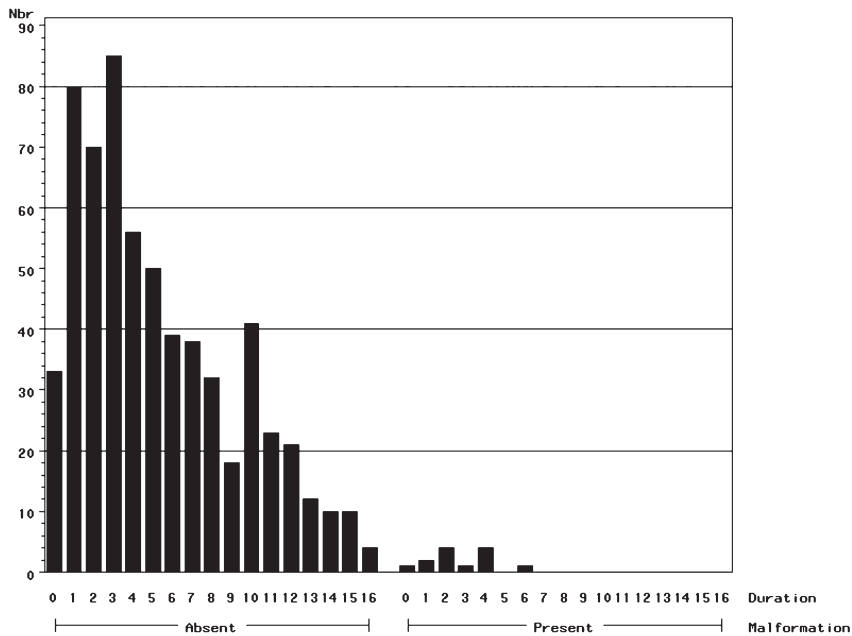
Endpoint	Corrected for	Goodness-of-fit (Likelihood ratio)		Residence		Conclusion
		Df	Chi_ Prob.	Df	Chi ² Prob.	
Gestational duration	M, G, A, C	26	32.78 0.169	2	1.86 0.395	NS
Birth weight	M, G, A, C	26	27.35 0.391	2	1.88 0.390	NS
Parity	A	8	3.34 0.911	4	1.40 0.845	NS

Corrected for: M: multipliets, G: gender, A: maternal age, C: congenital anomaly, D: gestational duration, B: birth weight

Frequency of congenital anomalies and of multiple pregnancies in the resident mothers

We examined the dose-response relationship between congenital anomaly and the explanatory variables, namely maternal age (dichotomised into less than 35 years and otherwise); occupational group of the parents; multiple births; gender; total duration of residence and duration of residence in the ten years preceding birth; calendar year and time interval between date of departure and birth. In order to reduce possible biases in the choice of models, we used the automated selection options provided by the LOGISTIC Procedure of SAS (47). Each time, we obtained a model consisting of a single explanatory variable: prenatal duration of residence with an odds ratio of 0.78 (0.60, 0.95). Note that all the cases of congenital anomaly occurred in women with duration of residence of six years and less, about two thirds of the total cohort (Figure 1). Conversely, the occurrence of multiple pregnancy was not significantly related to duration of residence.

Figure 1:
Number of children with or without a congenital anomaly according to duration of residence (in years) of the mother in Neerland before birth



Discussion

Design of the study

Regarding congenital anomalies our study was clearly post hoc. In such cases, the area of concern may cross administrative boundaries and cause the dilution of the real effects due to the size of these units, which are often considerably larger than the exposed area. A 'natural' reaction to this dilution is boundary tightening, the artificial delimitation of the exposed area to the area with a maximum concentration of cases and which applies to the Neerland case (4). As a result, we had to deal with problems of occult multiple testing and boundary tightening, leading to an overestimation of the prevalence of congenital anomalies (1;4;48;49). In this context, even in the presence of a higher SES in Neerland, an adjusted odds ratio of 1.20 (0.69; 2.08) may be considered as little evidence in favour of an excess of congenital anomalies.

Because of regional differences in case assessment, disease rates may vary geographically and since this phenomenon may be less pronounced in neighbouring areas (4), we compared the occurrence of congenital anomalies in resident mothers with that of non-resident mothers delivering in the same obstetrical units. This comparison showed almost identical results as the comparison with the rest of Flanders.

Statistical aspects

As already mentioned, statistical tests are biased in a post hoc situation. Nevertheless, in a context of a distrustful community and having to underpin a politically delicate decision, we had to appreciate the magnitude of possible health threats. The statistical methods we used are classical ones, avoiding issues with the underlying spatial distribution of the endpoints under study. Since the geographical precision of our data was much greater in the index population than in the rest of Flanders, the reference population, spatial methods were not suitable (4). Due to the intense internal movements these methods were not suited to our analysis regarding resident mothers either. Further note that 338 of the 636 children in our study, accounting for 6 out of 13 cases of congenital anomaly, were born outside Neerland and would not have been taken into account by disease mapping methods. This finding offered some protection to migration bias as well (37).

Value of routinely collected data

Registered data allow an objective classification of cases prior to any knowledge of an endpoint, which constitutes a built-in safeguard against information bias. The small time-gap between the occurrence of the health phenomena and their recording diminishes the danger of misclassification and thus of loss of statistical power with bias of the results towards no association (53).

Where most of the endpoints of our study are univocal, congenital anomalies constitute a complex problem (38). Specific drawbacks include late detection, prenatal diagnosis and medical abortion, early stillbirth, and variation in reporting and coding (35,54). Further, congenital anomalies are prevalent cases rather than incident cases and may compete with other endpoints of reproductive epidemiology (55). Moreover, the SPE registry only includes foetuses with a birth weight of at least 500g, thus excluding early miscarriages and medically induced abortions (56). In this respect, the National Abortion Registry, which records only the province of residence, was not suitable for our study. Nevertheless, all of these drawbacks apply equally to the index as well as to the reference population and it is precisely the comparison between the two groups that constitutes the primary focus of interest, not the rate of congenital anomalies.

A very high degree of completeness of data may be assumed. In the SPE registry perinatal deaths and live births occurring in the participating Flemish obstetrical units are recorded as well as a proportion of the home deliveries, which constitute only about 1% of all deliveries. The data are collected continuously and are submitted to an organised system of quality assurance (56). To adjust our cohort-analysis for socio-economic status, the SPE-file was linked with the official birth files with a matching rate of 96%. Note that in our final database we retrieved all cases reported by the Neerland population and occurring in the registration period. The data from the Antwerp municipal register and the National Register may be considered almost complete and of good quality as they are frequently used for administrative purposes.

Endpoints of the study

The reported results, multiples excepted, were statistically not significantly different between the index and the reference population. Regarding congenital anomalies, the power analysis restricts the grey zone of non-significance to odds ratios of less than two. A possible harvesting effect, in which at low dose borderline cases are eliminated,

might have resulted in fewer cases and higher mortality (57). The rates of the perinatal mortality and of malformations in the index versus the reference population, the absence of an excess mortality and of a reversal of the sex ratio do not support this hypothesis (23). The apparently protective effect of an inverse dose-response relationship in resident mothers may be due to the use of duration of residence as an inadequate surrogate quantitative exposure measure (58) or to the competition of other reproductive endpoints such as very early pregnancy loss (35). Both are hypotheses we cannot exclude. The other reproductive endpoints, multiples excepted, and the study of the soil contamination, indicating the presence of other important sources of dioxin exposure, seem to exclude a significant etiologic contribution of the incinerators to the occurrence of congenital anomalies as well.

The scientific discussion about the relationship between the occurrence of multiples and environmental pollution is still open. Should it exist, the effect of environmental pollution would be rather small and not univocal (30). It may also be interesting to mention that, in a radius of less than five kilometres around Neerland, there are three centres practising medically assisted initiations of the pregnancy. Their presence may have elicited more demands of this type of medical care and may have contributed to the excess of multiples (59). It may further be argued that compared with the rest of Flanders, the almost identical parity of Neerland mothers, the age distribution of primiparae, the comparable sex ratio and the absence of a dose-response relationship between exposure and occurrence of multiples in resident mothers do not produce evidence of reduced fertility due to environmental pollution.

Risk perception and communication

Municipal waste incinerators in earlier days were heavy polluters, causing hindrance and possibly health threats. The fright factors present in Neerland may have contributed greatly to the risk perception. These included an involuntary exposure, inescapable by taking personal precautions, a man-made and novel source of pollution, causing irreversible damage to small children (60). Further, on top of the absence of a system able to respond quickly and effectively to environmental problems (58,61), the community's complaints have been disregarded for far too long by the authorities. All of these, in turn, may have caused long-lasting stress (62).

Conclusions

The study of clusters rarely contributes to science and should be avoided (51). But, given the particular situation requiring a quick and underpinned advice and confronted with a not cooperative local community, we had no other choice but to carry out a post hoc cluster-analysis of congenital anomalies as well as an assessment of the reproductive health, using available routinely collected data.

Our study suffers from many methodological limitations. The analysis – a sub-optimal intercommunity comparison (58) instead of, for instance, a case-control study – remained confined to the mere comparison of cases in the exposed area with those in the overall population, without a precise description of the lesions and with no information regarding early miscarriages and abortions. In addition, sufficient detail was lacking regarding SES, type and source of pollutants, and intensity of exposure, precluding a formal exclusion of a cluster of congenital anomalies. Nevertheless, given the built-in protection against differential misclassification, we are confident that these data allowed us both to restrict the potential excess of cases of congenital anomalies to an odds ratio of less than two – as the baseline frequency is very low – and to have furnished sufficient evidence to exclude a worrisome situation regarding the reproductive health in Neerland.

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Abstract

Background: Na herhaalde klachten over congenitale afwijkingen in de buurt van twee verbrandingsovens, gesloten wegens het overschrijden van de emissienormen, besloot de overheid de herneming van de activiteiten slechts toe te laten indien aan de normen voldaan werd en indien de resultaten van een studie van de mogelijke schadelijke gevolgen op de perinatale gezondheid van de buurt dit toelieten. Aangezien de lokale bevolking weigerachtig stond tegenover een deelname aan een dergelijke studie, konden we alleen op routinegegevens beroep doen.

Methoden: Het betrof een observationele studie over de Neerlandwijk in de Antwerpse agglomeratie, met een ecologische en een retrospectieve cohortcomponent, waarbij gegevens uit verschillende medische en administratieve gegevensbanken gekoppeld werden. In een gegevensbank van alle kinderen die in Vlaanderen geboren waren tijdens de periode 1989-1996 (N= 506 632), werd een groep van 636 kinderen, waarvan de moeder ooit in Neerland woonachtig was, geïdentificeerd en vergeleken met de doorsnee Vlaamse bevolking.

Resultaten: De vergelijking met de doorsnee bevolking, afgezien van een meerlingenexces (odds ratio (OR) 2,04; 95% betrouwbaarheidsinterval (BI) 1,33-4,76), toonde geen significant exces aan van congenitale afwijkingen, perinatale mortaliteit, laag geboortegewicht, korte zwangerschapsduur, verminderde pariteit of omkering van de geslachtsratio (OR 1,20; 95% BI 0,69-2,08). Binnen de groep van Neerlandkinderen werd een significant en negatief verband vastgesteld tussen blootstellingsduur van de moeder en het voorkomen van congenitale afwijkingen (OR 0,78; 95% BI 0,60-0,95).

Conclusies: Hoewel de studie duidelijk een aantal beperkingen vertoonde en hoewel een exces van congenitale afwijkingen noch bevestigd noch uitgesloten kon worden, leken de vaststellingen niet het bestaan van ernstige gezondheidsbedreigingen te suggereren.

Abstract

Background: Vu les plaintes répétées concernant la survenue de cas d'anomalies congénitales dans les environs de deux incinérateurs, fermés pour violation des normes d'émissions, les autorités ont décidé de conditionner la réouverture aux résultats d'une étude sur les éventuels effets nocifs de ces émissions pour la santé reproductive des habitants du voisinage.

Puisque la population locale était peu encline à participer à une telle étude, nous dûmes nous borner à l'utilisation exclusive des bases de données collectées en routine.

Méthodes: Etude par observation concernant Neerland, un quartier dans l'agglomération d'Anvers, comprenant une composante écologique et une composante d'une étude de cohorte rétrospective, dans laquelle des données de plusieurs banques de données étaient appariées.

Dans un fichier incluant tous les nouveaux-nés de la Région Flamande pendant la période 1989-1996 (N= 506 632), nous avons pu identifier un groupe de 636 enfants, dont les mères avaient habité à Neerland à un moment donné, et comparer ces enfants à l'ensemble des nouveaux-nés.

Résultats: A l'exception de multiplets (odds ratio (OR) 2,04; intervalle de confiance (IC) à 95% 1,33-4,76), la comparaison avec la population générale n'a pas révélé d'excès significatif d'anomalies congénitales (OR 1,20; 95% IC 0,69-2,08), de mortalité périnatale, d'insuffisances pondérales à la naissance, d'accouchements prématurés, de parité ou une inversion du sex ratio. Cependant une relation significative et négative a été obser-

vée dans le groupe d'enfants de Neerland entre la durée d'exposition de la mère et la survenue d'anomalies congénitales (OR 0,78; 95% IC 0,60-0,95)

Conclusions: Quoique l'étude souffre de limitations évidentes et qu'un excès d'anomalies congénitales n'a pu être ni confirmé ni exclu, les constatations portant sur la santé reproductive ne semblent pas suggérer l'existence de menaces majeures pour la santé.

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