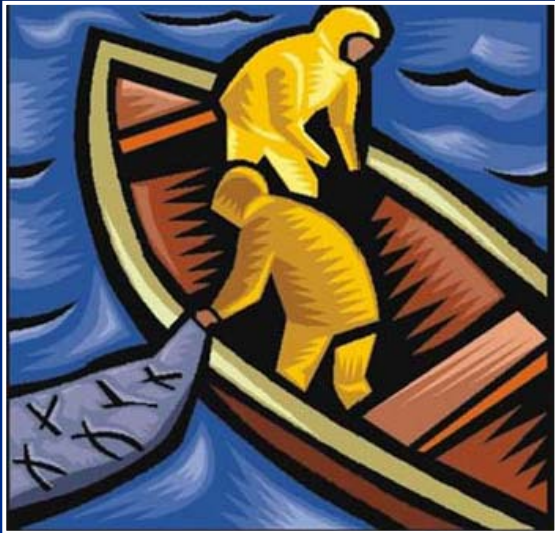




Prestige Oil Spill and Health Effect



Francisco Pozo-Rodríguez
SEPAR-Prestige Study Group

Torre del Mar 12 Marzo 2009



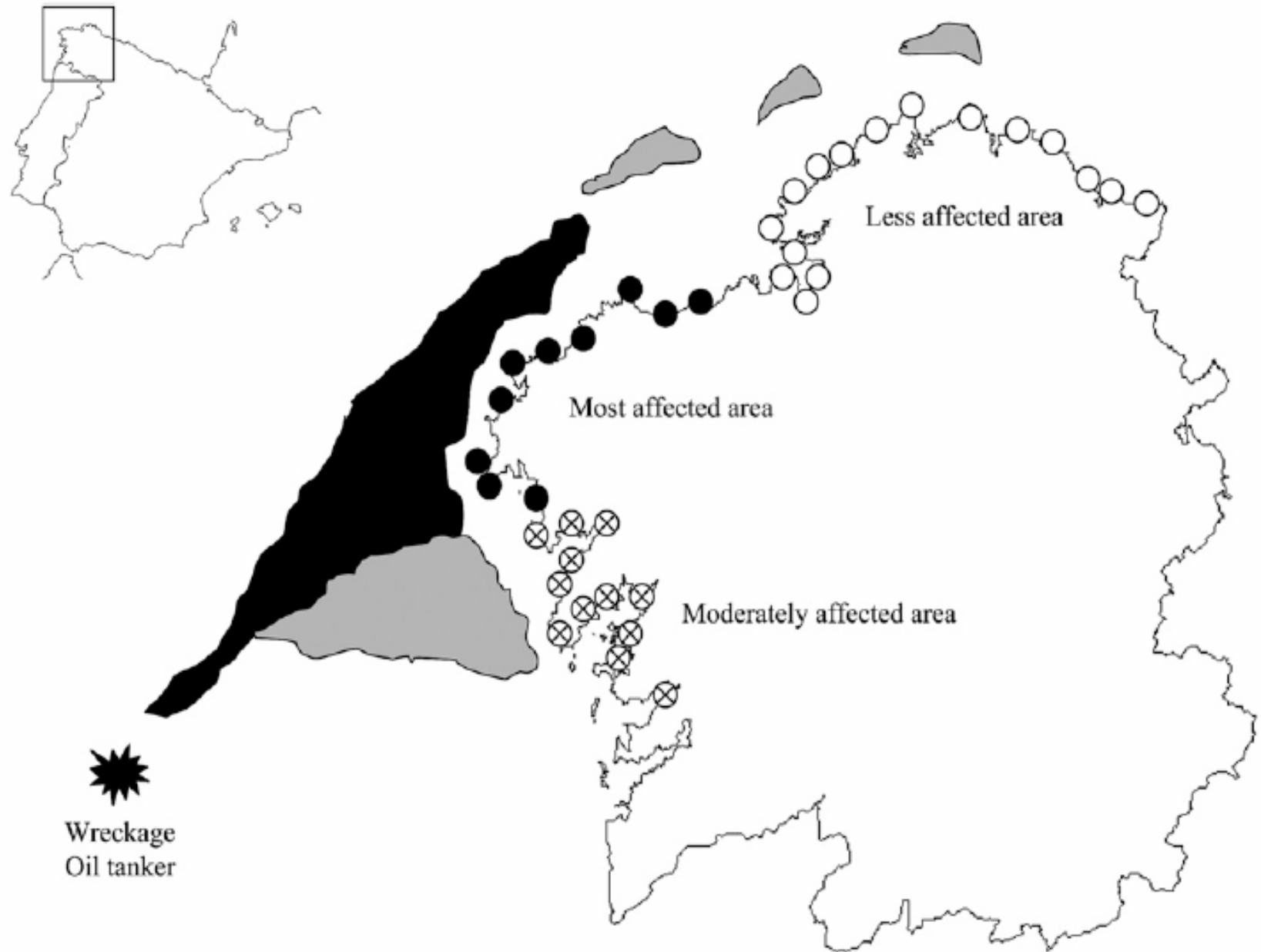
Prestige Oil Spill



- November 19, 2002
- 77.000 Tons of “Bunker C oil”
 - Hydrocarbons, resins, heavy metals, among others
- 60.000 Tons spilled out
- Clean-up activities:
 - Local fishermen, volunteers, army personnel, specialized companies
 - Improvised activities; lack of information and protective measures
 - A high number of fishermen participating > 1 year







Wreckage
Oil tanker











The SEPAR-Prestige Study Project I

The SEPAR-Prestige Study Project II

Epidemiological study on clinical, functional and biological repercussions of exposure to oil spillage from the tanker 'Prestige' on respiratory health of fishermen from the Galician coast.

- Health Research Fund (FIS-Spanish Ministry of Health)
- Spanish Respiratory Society (SEPAR)
- Spanish Research Respiratory Network (RESPIRA)

SEPAR-Prestige Study Group



- *Chairmanship* : JA Barberà, F Pozo, H Vereá.
- *Principal Investigators:*
 - JP Zock, JM Antó, L Bouso (IMIM, Barcelona)
 - G Rodríguez-Trigo (CHU A Coruña)
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 - C Fuster, G Monyarch (UAB)
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 - A Serrano, O Bulbena, J Tò (Hospital Clínic-IDIBAPS, Barcelona)
 - MD Coll, A Rigola, J Egozcue (UAB)
 - E Toubes (Hospital de Ourense)
 - I Isidro (Instituto Nacional de Silicosis, Oviedo)
 - A Palacios (Hospital Clínic, Santiago de Compostela)
 - M Suárez (Hospital Xeral, Vigo)

Hypothesis



1. Inhalatory exposure to volatile hydrocarbons to the Prestige oil spill produces airway inflammation and bronchial hyperreactivity.
2. Fuel oil exposure produces chromosomal instability and increases the risk of cancer.

Methods

Study design: cross-sectional

Study population: Galician coastal fishermen and shellfish farming

Study setting: 1 ½ years after exposure



Population based survey
N= 9,050

Screening questionnaire

Study sample
N=1000

500 exposed

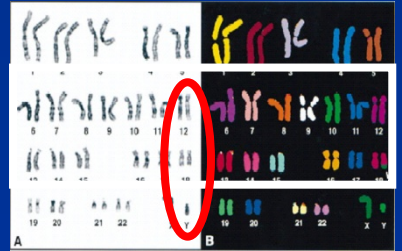
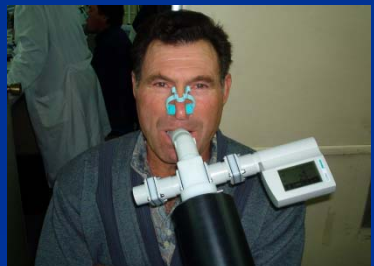
500 non exposed

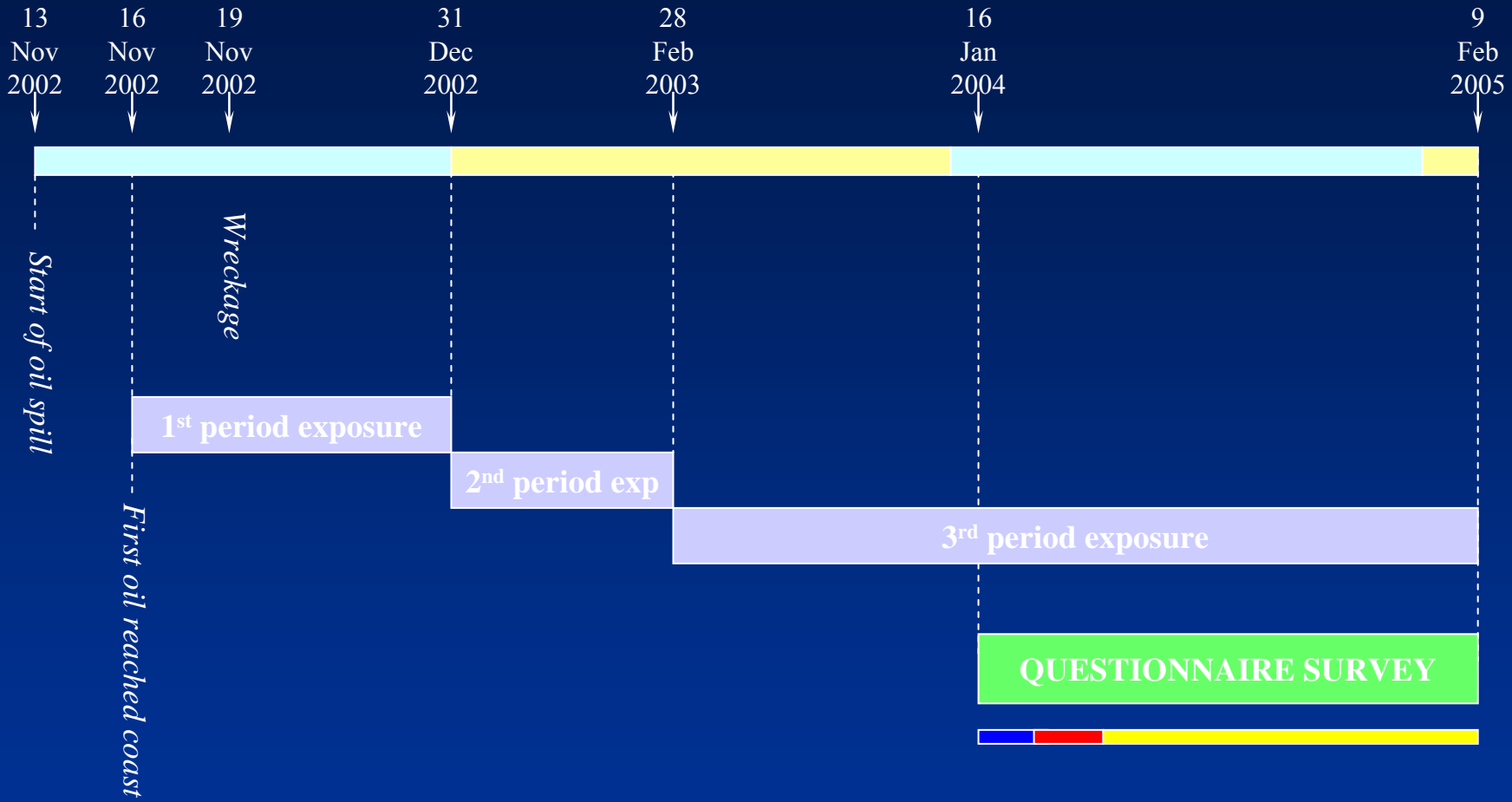
RR 1.5
Power 80%
 α 0.05

Respiratory clinical
and functional study

Inflammation markers
Exhaled breath condensate

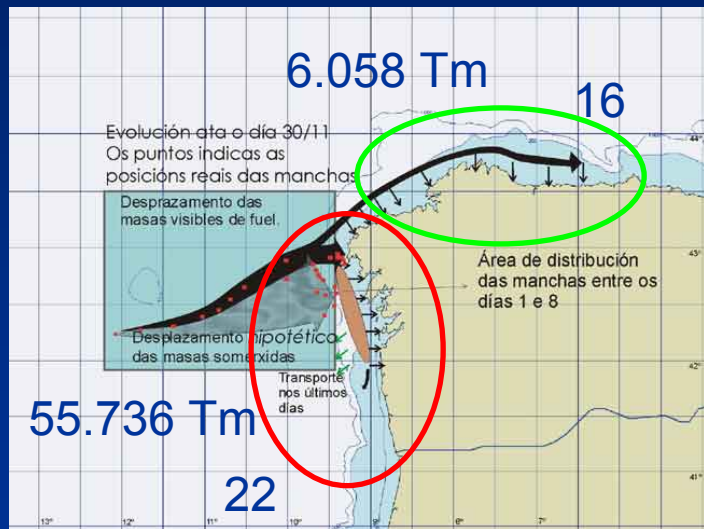
Genotoxicity
Chromosomal analysis







Study sample: Selection criteria



Exposed people (E):

To live in a heavily contaminated area
And to be involved in clean-up: all

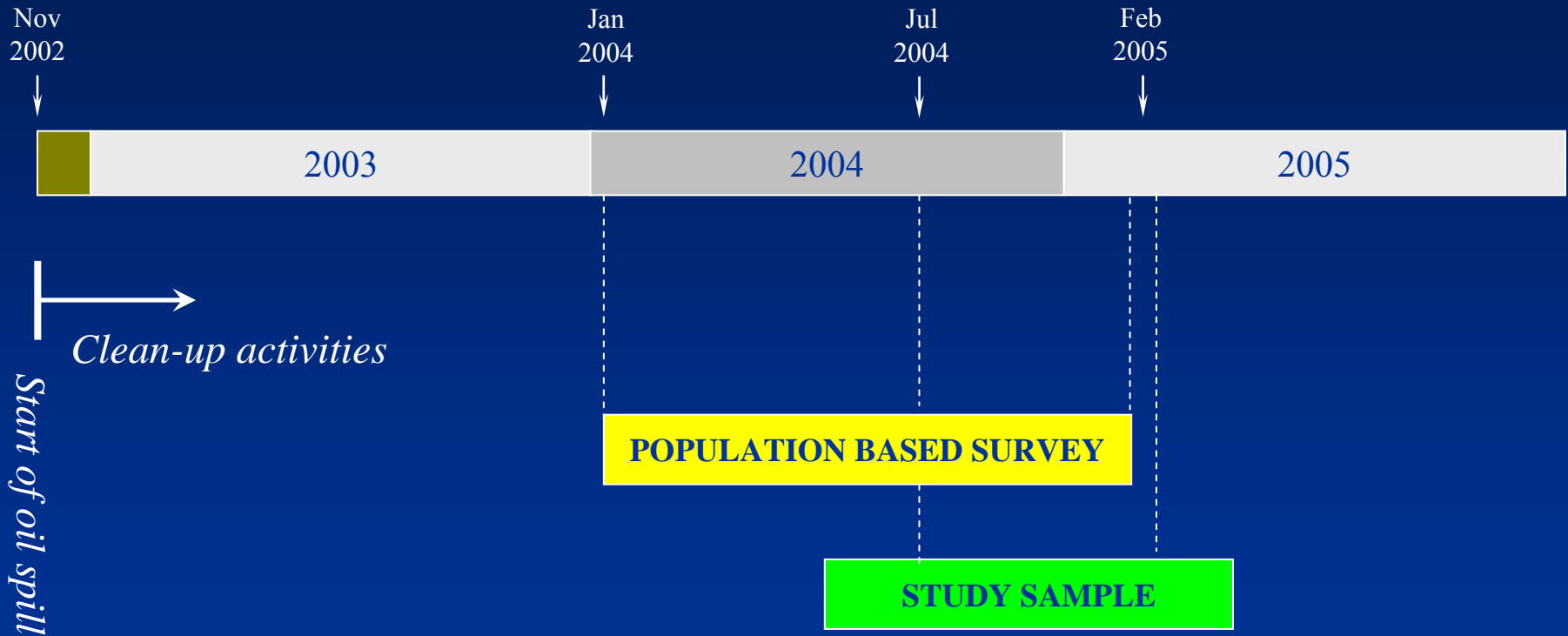
- 1st period
- at least 4 h per day
- at least 15 days

Non exposed people (NE):

To live in a low contaminated area
And not be involved in clean-up works for reasons other than health

High participation in clean-up activities (67% E y 45% NE)
Problems to include non exposed individuals

Field work: Chronology




Population based survey: Field work

Site visit

Questionnaire

Cofradías Mariñeiras Galegas

O vertido do Prestige...
¿Alteroulle a sua saúde?



¡Vostede pode axudar a conecelo!

CUESTIONARIO DE SAUDE

- É **moi importante** que conteste o cuestionario aínda que vostede **non** participara na limpeza do chapapote.
- Por favor, **complete todo** aínda que non teña molestias nin problemas de saúde.
- Só tardará **10 minutos** en completalo.
- Despois de cubriilo, devóvallo ó coordinador na súa cofradía.
- As respostas deste cuestionario son **total e estrictamente confidenciais para este estudo de saúde** como esixe a Lei de Confidencialidade de Datos.
- Estes cuestionarios serán repartidos a 14.000 mariñeiros en 44 cofradías galegas. Cando estén analizados, enviaremoslles os resultados totais a cada unha das cofradías.
- É posible que lle solicitemos a súa colaboración para a segunda fase do estudo, na que faremos probas respiratorias nun pequeno número de mariñeiros, escollidos por sorteo (o chou). Por ese motivo pediremoslle algúns datos persoais ó final do cuestionario.
- Se desexa máis información sobre o estudo **PRESTIGE E SAÚDE** chámennos os teléfonos de contacto que encontrará na súa cofradía.

Agradecemoslle encarecidamente o seu interese e colaboración

- 1 -

¿Qué recibe vostede a cambio?

- 1 Vostede terá unha valoración completa da súa saúde respiratoria.
- 2 Recibirá UNHA COPIA das probas realizadas.
- 3 A satisfacción de ter colaborado nun estudo médico que servirá para mellorar a CALIDADE de VIDA de homes e mulleres, mariñeiros galegos e orientar na prevención de posibles enfermidades respiratorias no futuro.

Para máis información, preguntar pola enfermeira (Sra. Yolanda Torralba) ou a calquera dos médicos do estudio (Coordinadora: Dra. Gemá Rodríguez Trigo)

O LUGAR ONDE REALIZAREMOS O ESTUDIO SERÁ NA COFRADÍA:

Para máis consultas:


CENTRO COORDINADOR

- Servicio de Neumología Hospital Universitario Juan Canalejo Xubias de Arba, 84 - A Coruña Tels. 981 17 91 81 - 981 17 81 82

CENTROS COLABORADORES

- Hosp. Clínico Universitario, Santiago
- Hosp. Xeral, Vigo
- Hosp. Cristal Pílar, Ourense
- Hosp. Clínic I Provincial, Barcelona
- Hosp. 12 de Octubre, Madrid
- Inst. Nacional de Silencios, Oviedo
- IMIM, Barcelona
- Dto. Biología Celular, U.A., Barcelona

Sociedad Española de Neumología y Cirugía Torácica SEPAR



estudio de saúde dos mariñeiros galegos

Sociedad Española de Neumología y Cirugía Torácica

Information

¿qué investigamos?

O que queremos saber é como afectou a limpeza do chapapote derramado polo buque Prestige á saúde respiratoria dos mariñeiros, homes e mulleres, e como solucionar os problemas que puideran aparecer nun futuro.



¿quén participa neste estudio?

Na primeira parte do estudio, repartiremos cuestionarios a máis de 14.000 mariñeiros entre 20 e 65 anos de 44 cofradías distintas.

Na segunda parte, evaluaremos a 1.000 deses mariñeiros para coñecer máis detalles sobre a súa saúde.

¿En qué consiste a súa participación?

A PARTICIPACIÓN NO ESTUDIO É VOLUNTARIA

Se vostede decide colaborar con nós, pode elixir entre participar en todo o estudio, ou só nalgúnha parte.

Primeira parte:

Na primeira parte, se lle preguntará sobre a súa saúde, traballo, hábitos, costumes...

Segunda parte:

Na segunda parte, se lle farán probas respiratorias moi sinxelas. Mediremos a súa capacidade pulmonar e veremos se os seus brónquios están inflamados. Tamén se lle tomará unha análise de sangue para comprobar posibles alerxias.

É importante que estudie mos

Xente con e sin doenzas respiratorias.

Xente que: non participou, participou moito, bastante ou pouco, na recollida de chapapote, para comparar as diferenzas.



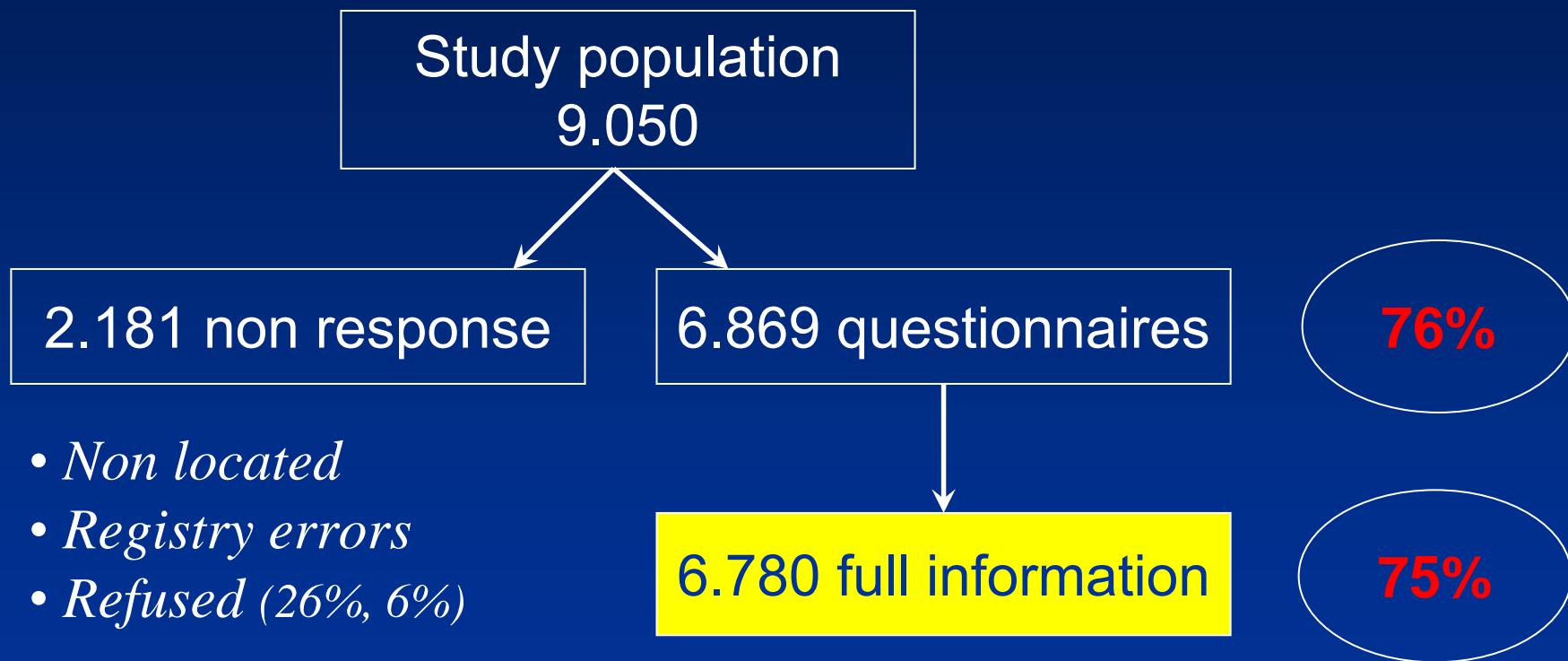

Mail



Phone

Population based Survey

Response Rate



Results population based survey questionnaire

Prolonged Respiratory Symptoms in Clean-up Workers of the *Prestige* Oil Spill

Jan-Paul Zock^{1,2}, Gema Rodríguez-Trigo^{1,3}, Francisco Pozo-Rodríguez^{4,5}, Joan A. Barberà^{5,6}, Laura Bouso¹, Yolanda Torralba^{5,6}, Josep M. Antó^{1,7,8}, Federico P. Gómez⁶, Carme Fuster⁹, and Héctor Vereza³, for the SEPAR-*Prestige* Study Group*

Am J Respir Crit Care Med Vol 176. pp 610–616, 2007

Originally Published in Press as DOI: 10.1164/rccm.200701-016OC on June 7, 2007

Internet address: www.atsjournals.org

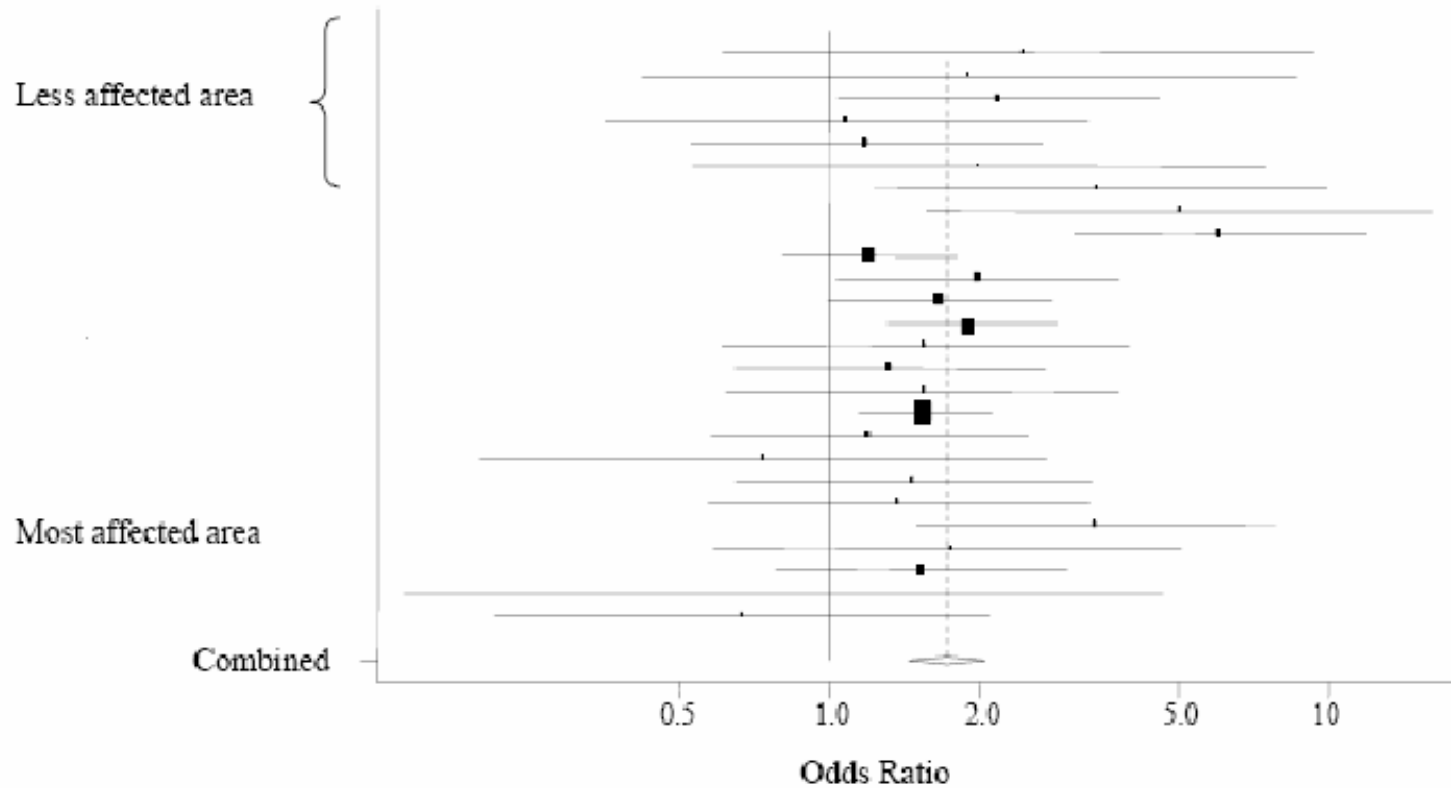
TABLE 1. CHARACTERISTICS OF STUDY POPULATION BY SEX

	Men	Women
Participants, n (%)	4,594 (100)	2,186 (100)
Age, yr: mean (range)	41.7 (17 to 80)	48.9 (17 to 78)
Current smokers, n (%)	2,230 (48.5)	330 (15.1)
Ex-smokers, n (%)	1,104 (24.0)	173 (7.9)
Coastal fishermen, n (%)	3,435 (74.8)	158 (7.2)
Shellfish farmers, n (%)	677 (14.7)	1,811 (82.8)
Other,* n (%)	482 (10.5)	217 (9.9)
Less affected area (16 cooperatives), n (%)	769 (16.7)	406 (18.6)
Moderately affected area (12 cooperatives), n (%)	2,701 (58.8)	1,496 (68.4)
Most affected area (10 cooperatives), n (%)	1,124 (24.5)	284 (13.0)
Participation in clean-up activities, n (%)	3,103 (67.5)	1,178 (53.9)
From November 16, 2002, to December 31, 2002, [†] n (%)	2,591 (83.5)	895 (76.0)
From January 1, 2003 to February 28, 2003, [†] n (%)	1,204 (38.8)	515 (43.7)
From March 1, 2003 onward, [†] n (%)	680 (21.9)	312 (26.5)
Total number of days involved, mean (range)	38.2 (1 to 576)	30.3 (1 to 349)
Number of hours per day involved, mean (range)	6.2 (0.5 to 24)	5.1 (1 to 19)

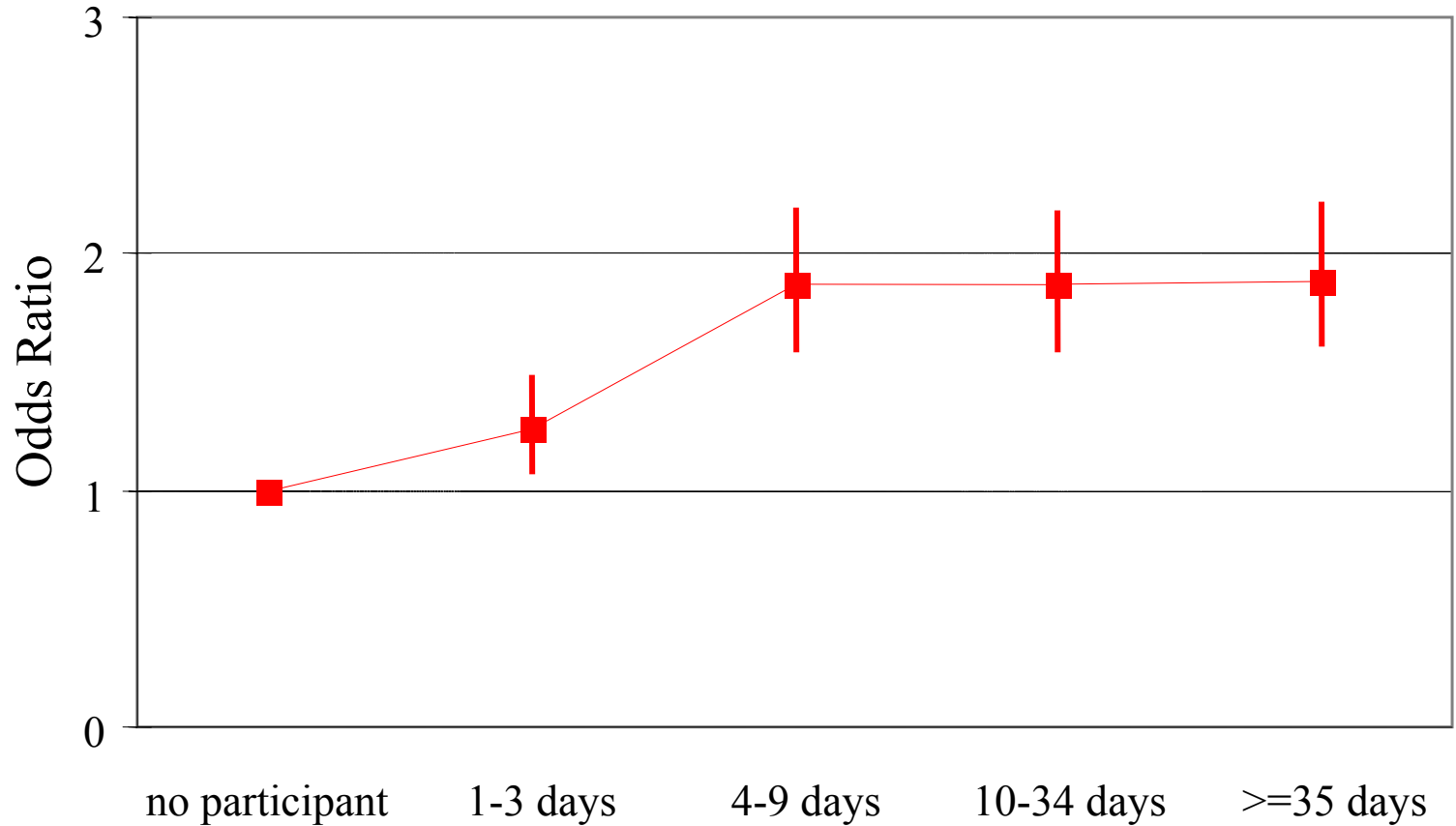
TABLE 2. ASSOCIATIONS BETWEEN PARTICIPATION IN CLEAN-UP ACTIVITIES OF THE *PRESTIGE* OIL SPILL AND RESPIRATORY OUTCOME BY SEX

	Men (<i>n</i> = 4,594)		Women (<i>n</i> = 2,186)	
	Prevalence (%)	OR (95% CI)*	Prevalence (%)	OR (95% CI)*
Wheeze with breathlessness	9.6	1.47 (1.17–1.85)	11.0	1.51 (1.14–2.01)
Wheeze apart from colds	10.5	1.61 (1.29–2.02)	9.1	1.30 (0.96–1.76)
Nocturnal attacks of shortness of breath	10.3	1.35 (1.09–1.68)	14.7	1.33 (1.05–1.70)
Chronic cough	16.1	1.99 (1.64–2.42)	17.1	1.71 (1.34–2.16)
Chronic phlegm	17.6	2.02 (1.67–2.43)	13.0	1.57 (1.21–2.05)
Any lower respiratory tract symptom [†]	33.4	1.84 (1.59–2.13)	33.7	1.55 (1.29–1.87)
Nasal symptoms [‡]	30.0	1.87 (1.62–2.16)	30.1	1.61 (1.33–1.94)
Inhalation medication usage	9.7	1.15 (0.93–1.43)	11.6	1.08 (0.83–1.40)
Oral medication usage	11.7	1.99 (1.60–2.48)	16.7	1.49 (1.18–1.88)
Asthma [§]	4.7	0.75 (0.56–1.00)	6.1	0.79 (0.55–1.12)
Chronic bronchitis [§]	4.6	1.08 (0.80–1.45)	3.8	1.19 (0.76–1.86)
Nasal allergy or rhinitis [§]	7.9	0.93 (0.74–1.18)	11.4	0.95 (0.73–1.24)

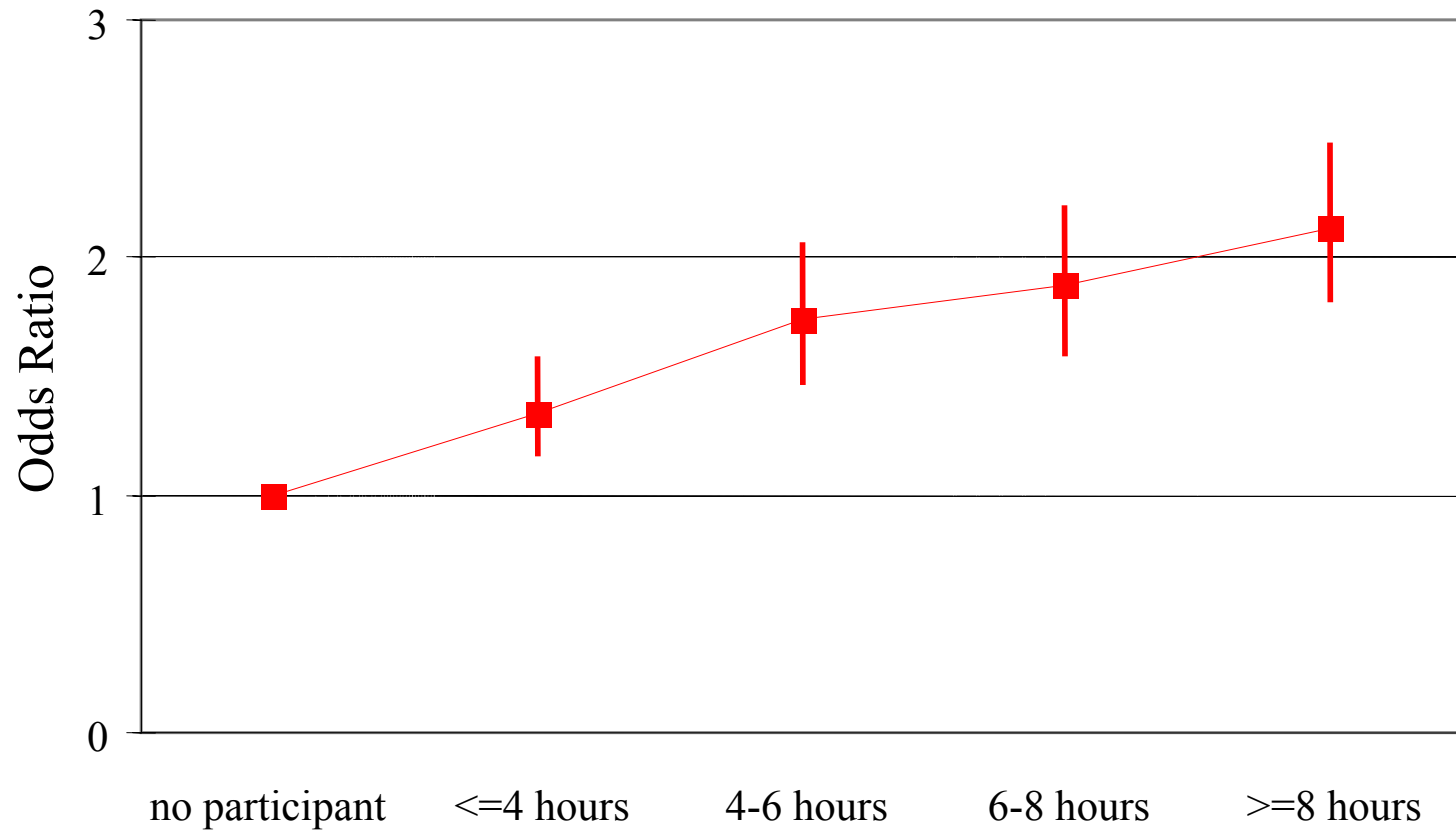
Association between participation in clean-up and LRTS by Fishermen's cooperatives



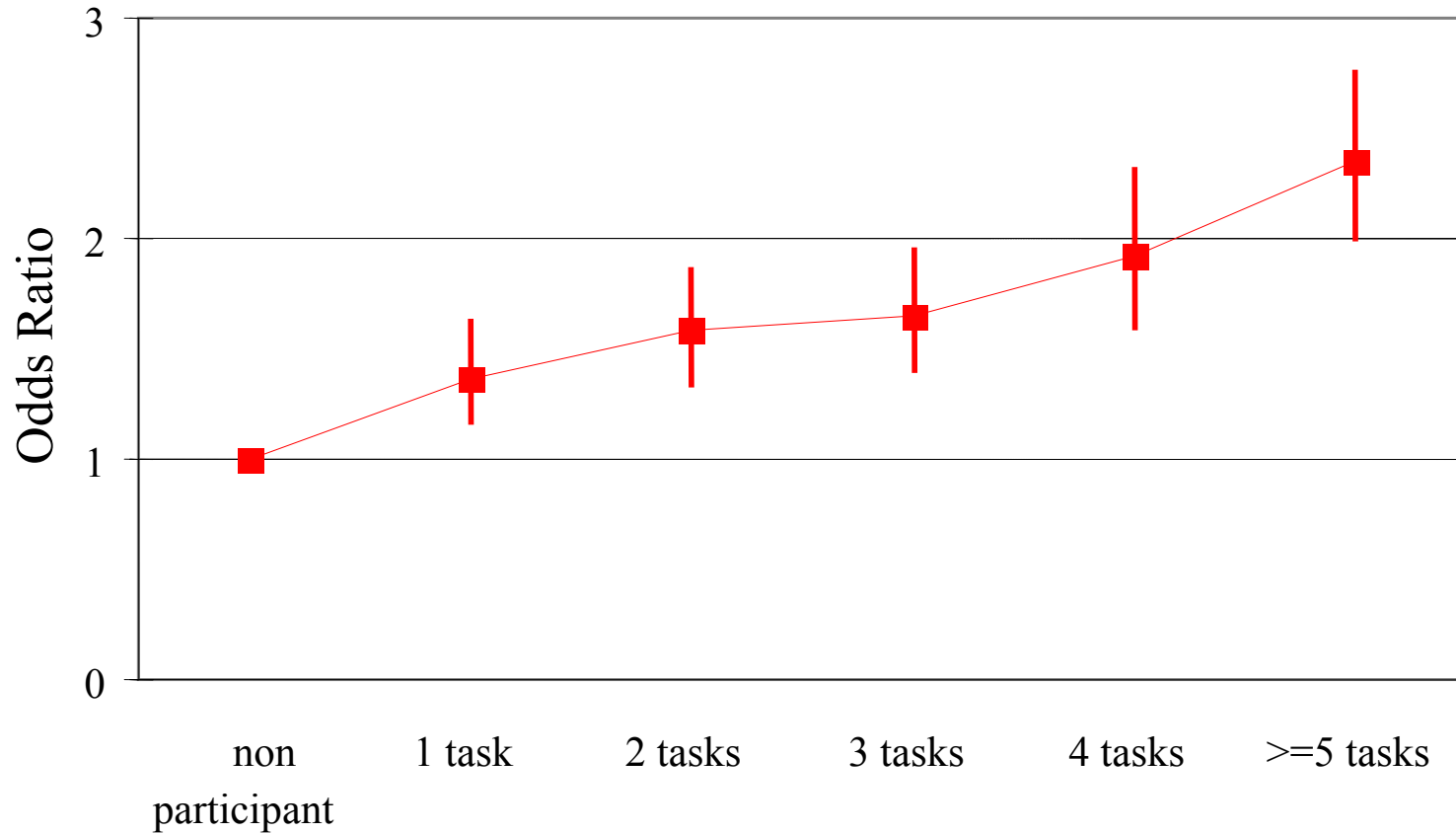
Dose response: Days – LRTS



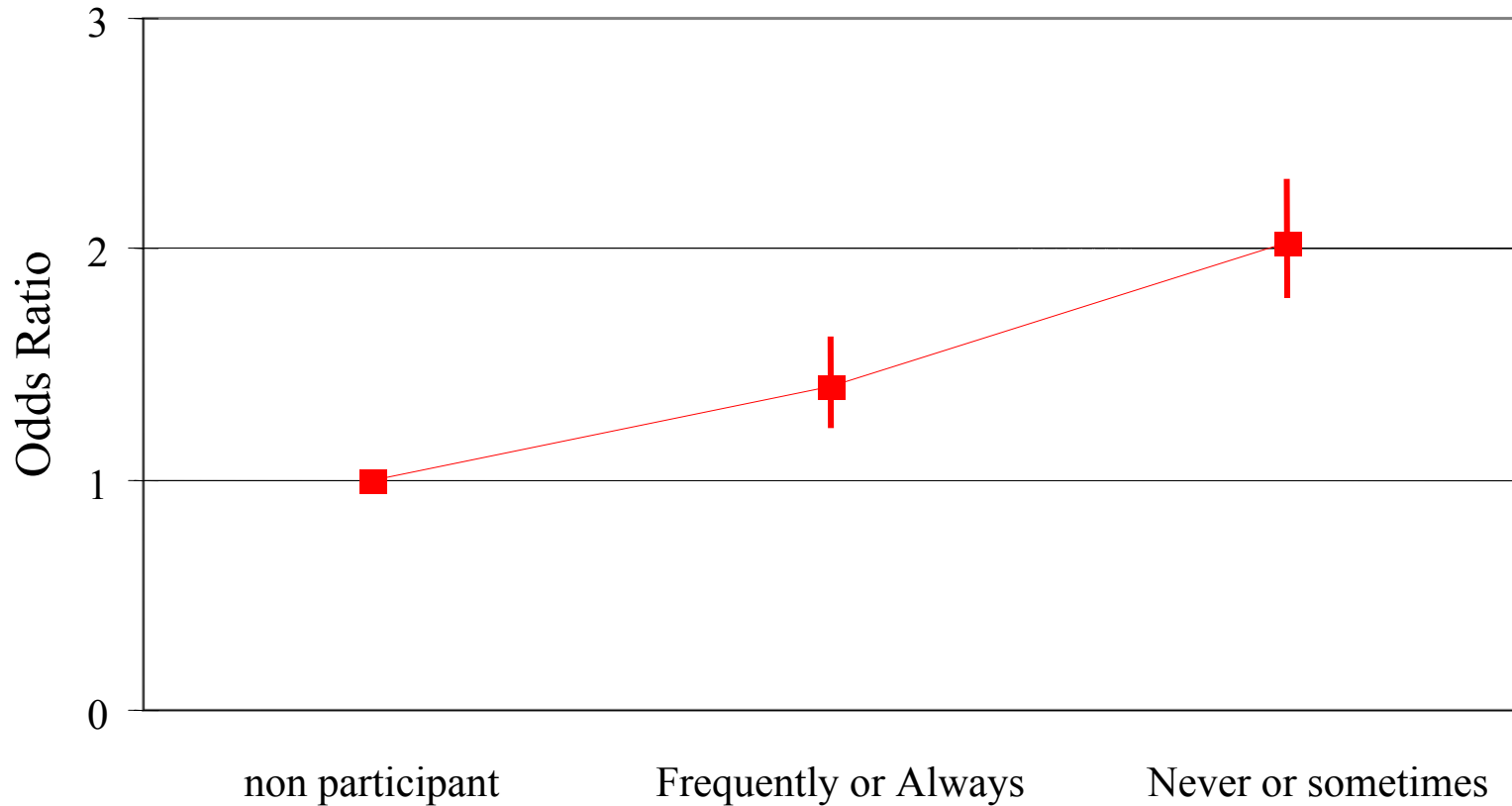
Dose response: Hours – LRTS



Dose-response: N c-up activities – LRTS



Dose-response: Mask use – LRTS



Mask use during clean-up activities

Conclusions



1. Fishermen who had participated in the clean-up work of the Prestige oil spill had an increased prevalence of respiratory symptoms more than one year after the disaster.
2. This association was consistent for several subgroups.
3. The risk increased with the duration of clean-up work.

Study sample (800)



Questionnaire Survey
38 Fishermen's Cooperatives
N=6,780



Highly Exposed to Clean-Up Work
N=1,119

Non exposed to Clean-Up Work
N=577

Agreed to Participate
N=598 (53%)

Agreed to Participate
N=205 (35%)

Study Sample
Exposed
N=501

Study Sample
Non exposed
N=177



Lifetime Nonsmokers
N=243

Lifetime Nonsmokers
N=92

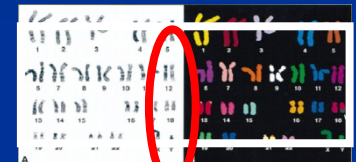
Inflammatory Markers in
Exhaled Breath
Condensate
N=77

Inflammatory Markers in
Exhaled Breath
Condensate
N=79



Determination of
Chromosomal
Abnormalities
in Lymphocytes
N=91

Determination of
Chromosomal
Abnormalities
in Lymphocytes
N=46



Field work (July 2004-February 2005)

Diary trip to the fishermen cooperatives



Questionnaires and clinical testing



In situ samples' treatment and upkeep





COMPLEJO
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UNIVERSITARIO
JUAN
CANALEJO
A Coruña

FONDO DE INVESTIGACION SANITARIA

FIS - FEDER 



SEPAR
División Española de Neurología
y Cirugía Torácica



SERGAS
Servicio Gallego de Saúde



PROYECTO
SEPAR
prestige

Study sample results

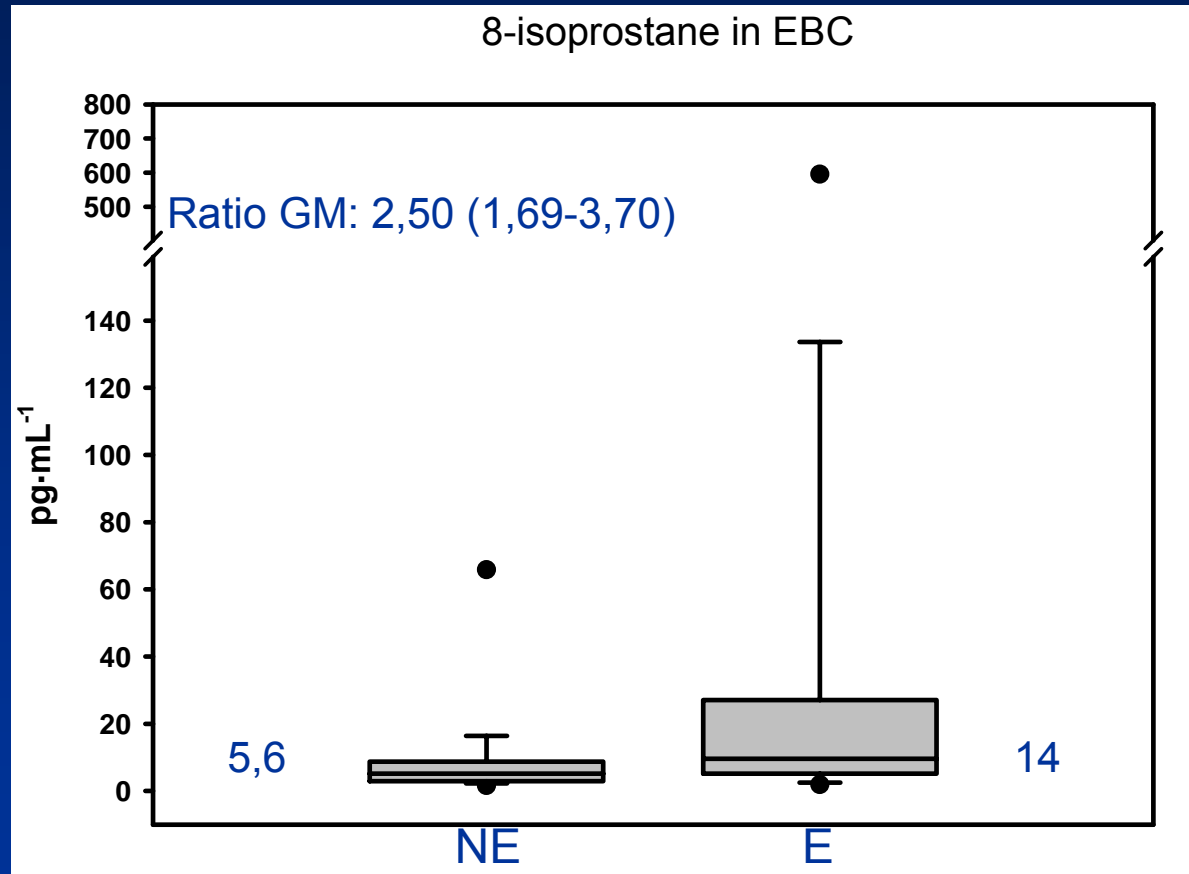


Characteristics	Exposed (N=501)	Nonexposed (N=177)
Female sex — %	28.1%	45.2%
Age — mean \pm SD (yr)	44.7 \pm 11.4	47.3 \pm 10.6
Smoking Status — %		
Never smoked	48.5%	52.0%
Former smoker	21.0%	16.4%
Current smoker	30.5%	31.6%
<i>Participation in clean-up work</i>		
Days of clean-up work — median (range)	87 (15–429)	0
Hours per day clean-up work — median (range)	6 (4–18)	0
Types of clean-up activities — median (range)	5 (1–10)	0
Use of face mask often or always — %	33%	0

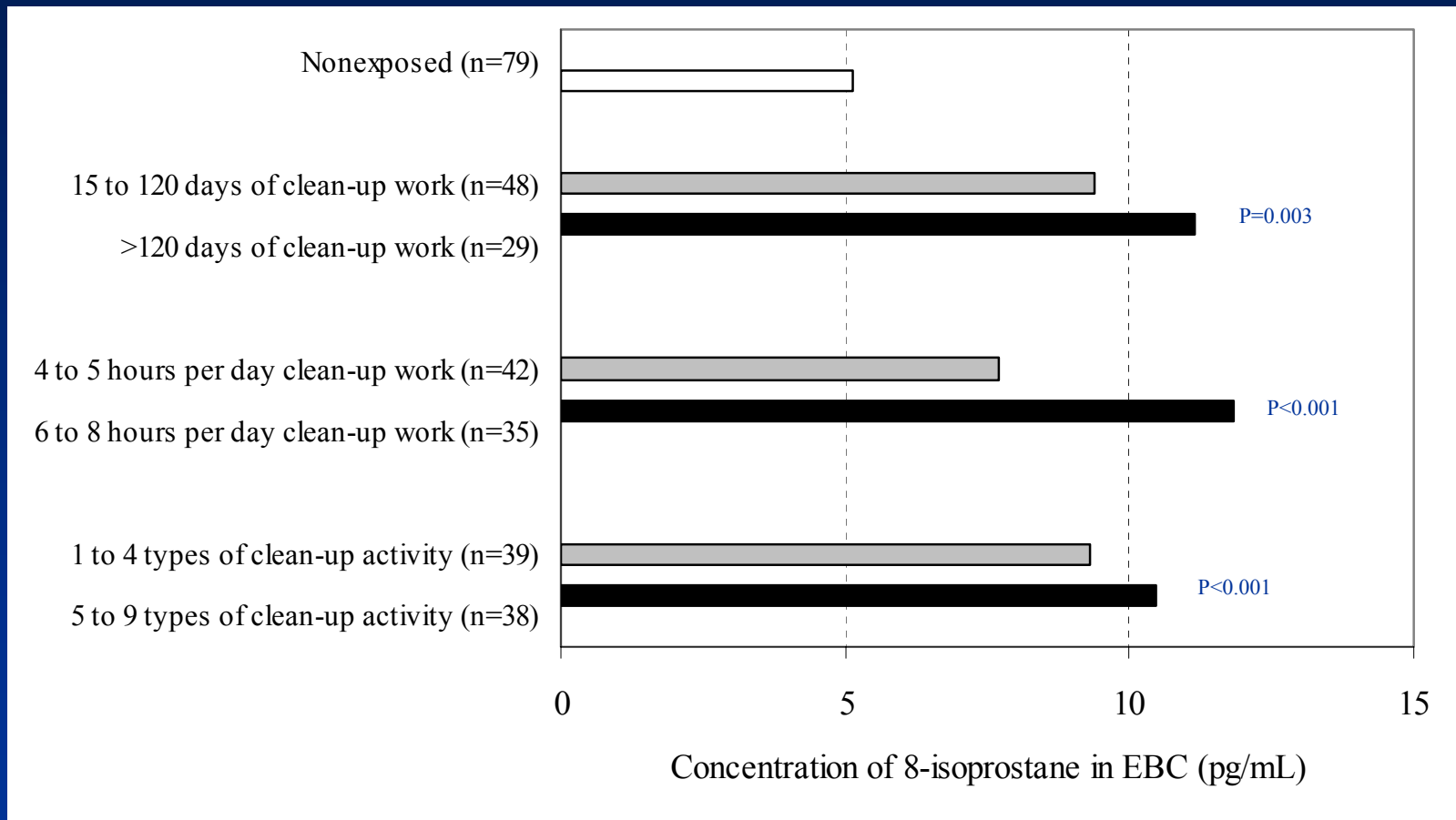
Variable — %	All Participants (N=678)			Lifetime Nonsmokers (n=335)		
	Exposed (N=501)	Nonexposed (N=177)	RR (95% CI)	Exposed (N=243)	Nonexposed (N=92)	RR (95% CI)
Lower Respiratory Tract Symptoms	27%	21%	1.3 (1.0–1.8)	22%	17%	1.5 (0.9–2.5)
Asthma-Like Symptoms	20%	18%	1.2 (0.8–1.7)	18%	16%	1.3 (0.8–2.3)
Bronchitis-Like Symptoms	13%	10%	1.4 (0.8–2.3)	8%	5%	1.8 (0.7–4.8)
Nasal Symptoms	26%	24%	1.1 (0.8–1.5)	25%	25%	1.1 (0.7–1.7)
Inhalation Medication Usage	8%	5%	1.7 (0.8–3.3)	7%	8%	1.0 (0.4–2.5)
Oral Medication Usage	6%	6%	0.9 (0.5–1.8)	5%	4%	1.2 (0.4–3.8)
FEV ₁ to FVC Ratio <0.70	9%	13%	0.7 (0.4–1.1)	3%	6%	0.7 (0.2–2.1)
FEV ₁ <80% of Predicted Value	9%	7%	1.1 (0.6–1.9)	5%	4%	1.1 (0.4–3.5)
Bronchial Hyperresponsiveness	18%	15%	1.3 (0.8–1.9)	15%	9%	2.5 (1.2–5.4)
EBC 8-isoprostane >10 pg/mL (N=77+79)	N.A.	N.A.	N.A.	48%	20%	2.4 (1.5–4.0)



8 isoprostano and exposure

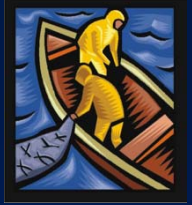


8-isoprostano: dose - response

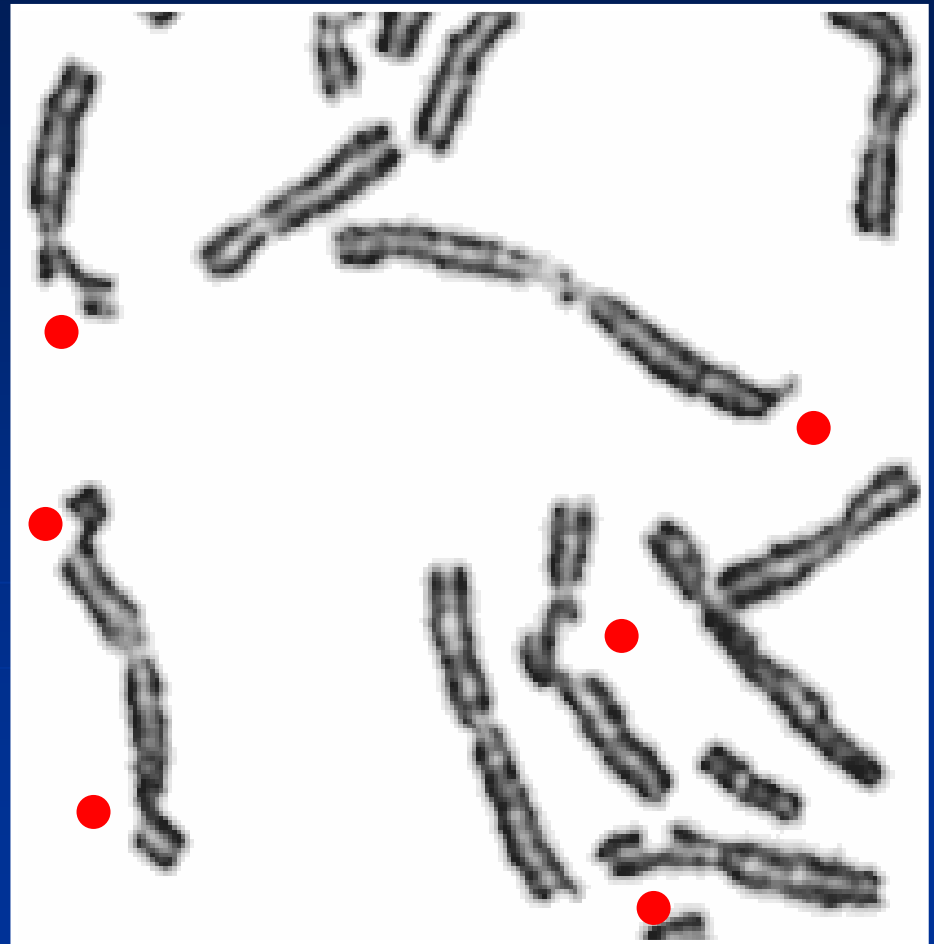
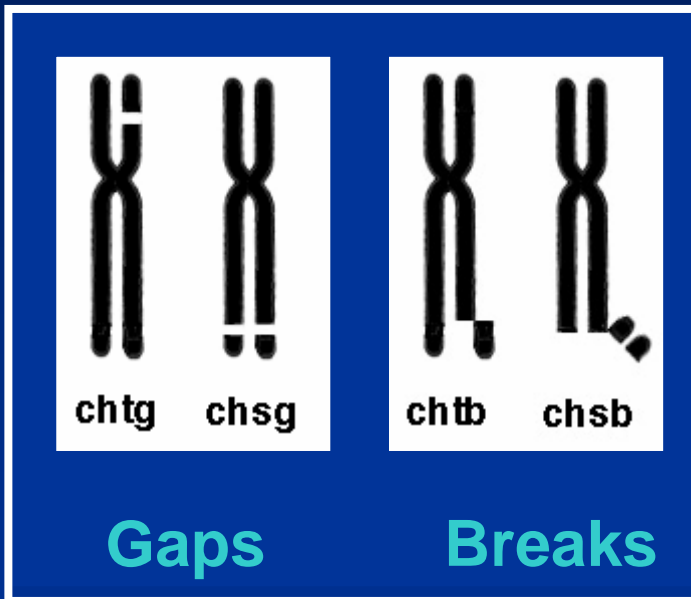


Cytokines in Exhaled Breath Condensate

Cytokine	Lower Limit of Detection (pg/mL)	Above Limit of Detection (%)		RR (95% CI)
		Exposed (N=49)	Nonexposed (N=50)	
Interleukin-2	11.2	14%	8%	1.6 (0.5–5.1)
Interleukin-4	1.4	16%	16%	0.9 (0.4–2.0)
Interferon- γ	1.8	27%	16%	1.4 (0.6–3.0)
Monocyte Chemotactic Protein-1	1.3	31%	20%	1.4 (0.7–2.6)
Fibroblastic Growth Factor	3.4	22%	6%	3.4 (1.0–12)
Vascular Endothelial GF	4.5	59%	14%	4.2 (2.0–8.6)
At least one out of 10 cytokines		71%	32%	2.1 (1.3–7.4)
At least two out of 10 cytokines		43%	18%	2.1 (1.1–4.0)



Chromosomal Imbalances

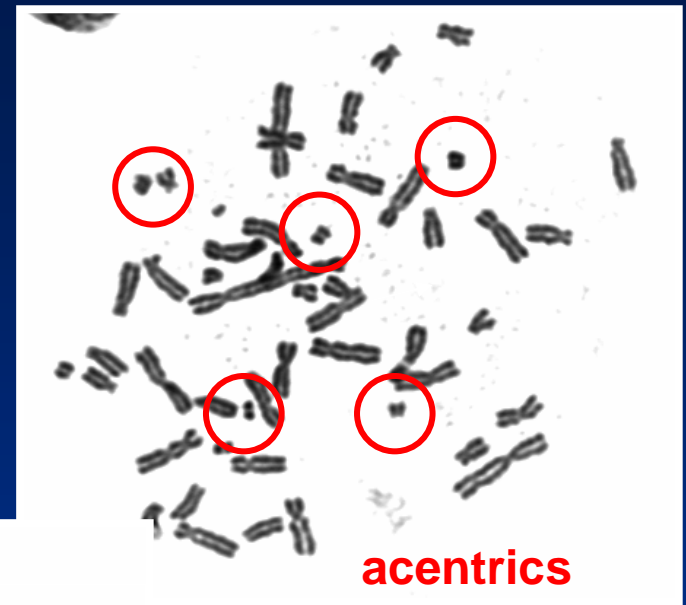




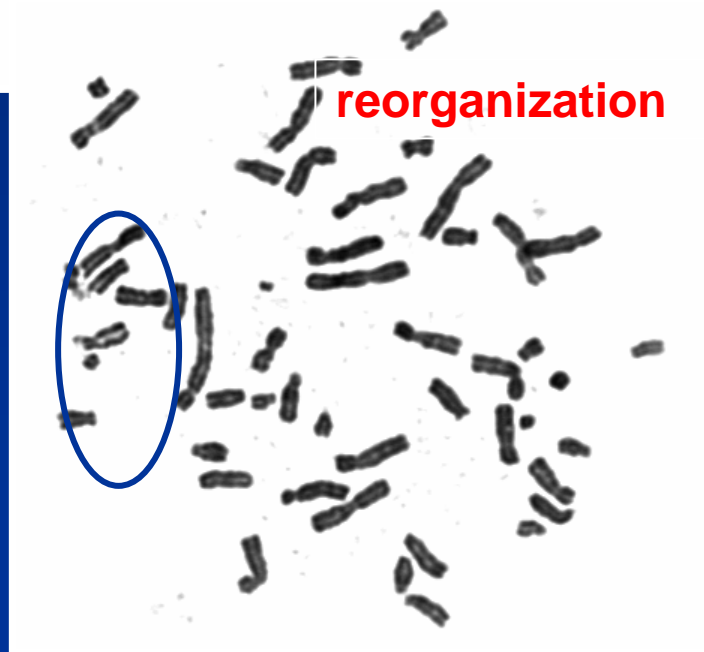
Balanced chromosomal rearrangements



rings



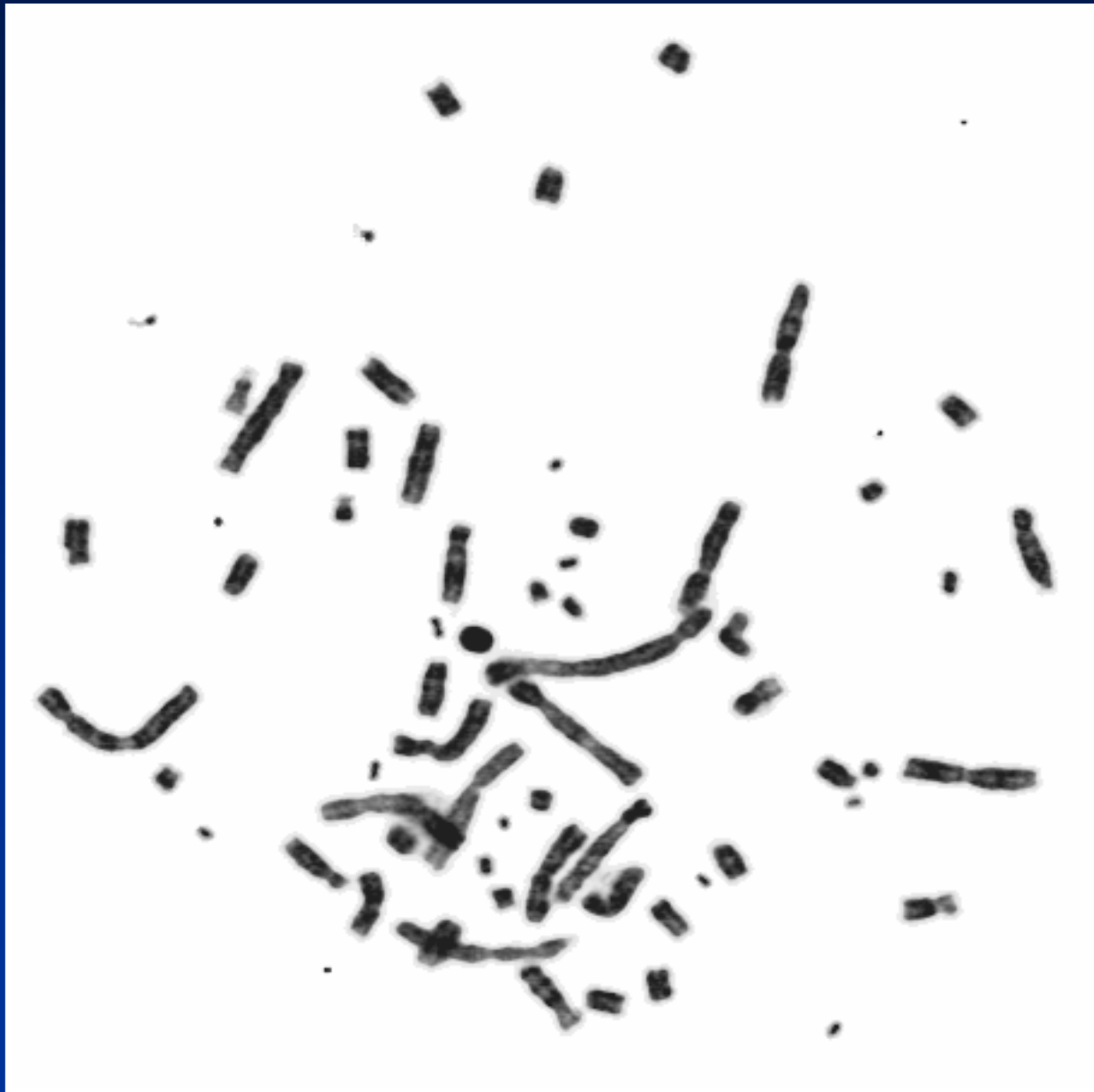
acentrics

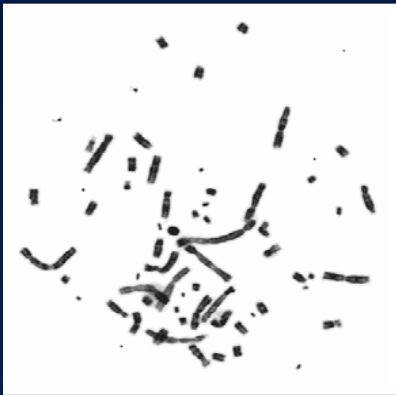


reorganization



Multiple alterations





Chromosomal Abnormalities

Chromosomal Abnormalities	Exposed (N=91)	Non exposed (N=46)	P (Fisher-Exact)	RR (IC 95%)*
Chromosomal imbalances	49 (54%)	20 (43%)	0.28	1.3 (0.8–1.9)
Balanced chromosomal rearrangements	21 (23%)	2 (4%)	0.007	5.6 (1.4–23)
Multiple Alterations	12 (13%)	1 (2%)	0.06	6.9 (0.9–52)

* Exposed vs. Non exposed Relative Risk (Confidence Interval 95%), adjusted for sex

Study sample: Conclusions



1. A high prevalence of respiratory symptoms remains in exposed fishermen 2 years after oil spill.
2. There is an association between exposure and BHR, specially for never smokers.



3. There is a dose related trend between 8-ISO levels and participation in clean-up activities, associated with symptoms. This probably indicates an oxidative stress mechanism.
4. The exposed fishermen have an inflammatory and remodeling pattern of markers in exhaled breath.



5. The exposure is associated with a 5-fold increase in the risk of finding balanced chromosomal rearrangements and / or multiple alterations.

6. A follow-up research is required in order to determine beyond doubt the presence of chromosomal instability.

The SEPAR-Prestige Study Project II

Follow up of study sample (678)



Persistent respiratory and genotoxic effects associated with clean-up activities of the Prestige oil spill: A follow-up study in fishermen from Galicia

- Health Research Fund (FIS-Spanish Ministry of Health)
- Galician Health Services (SERGAS)
- Spanish Research Respiratory Network (CIBER)
- Spanish Respiratory Society (SEPAR)



Questionnaire (May 08 - July 08)

- 623 individuals (678)
- Response Rate 92%

Results



	EXPOSED (n=466)	NON-EXPOSED (n=157)
Age: mean \pm SD (range)	48.0 \pm 11.3 (23–69)	51.2 \pm 10.7 (23–69)
Male	335 (72%)	83 (53%)
Female	131 (28%)	74 (47%)
Never smokers	233 (50%)	86 (55%)
Ex smokers	109 (23%)	28 (18%)
Current smokers	124 (27%)	43 (27%)
Asthma	16 (7%)	16 (10%)
Nasal allergy or rhinitis	70 (15%)	16 (10%)
Reported allergies	95 (20%)	34 (22%)
Atopy (SPT+ Phase 2) [n=463+156]	107 (23%)	28 (18%)
Anxiety (Q37)	139 (30%)	23 (15%)
'Health-belief' (Q38)	121 (26%)	14 (9%)

Symptoms and exposure



	EXPOSED (n=466)	NON-EXPOSED (n=157)	RR (95% CI)*
Wheeze with breathlessness	75 (16%)	18 (11%)	1.6 (1.0–2.6)
Wheeze apart from colds	73 (16%)	13 (8%)	2.0 (1.2–3.6)
Nocturnal attacks of SOB	59 (13%)	14 (9%)	1.7 (1.0–2.9)
Chronic cough	52 (11%)	9 (6%)	2.2 (1.1–4.3)
Chronic phlegm	53 (11%)	11 (7%)	1.8 (1.0–3.4)
Any lower respiratory tract symptom	165 (35%)	44 (28%)	1.4 (1.1–1.9)
Nasal symptoms	165 (35%)	46 (29%)	1.2 (0.9–1.6)
Inhalation medication usage	95 (20%)	22 (14%)	1.5 (1.0–2.3)
Oral medication usage	81 (17%)	20 (13%)	1.5 (1.0–2.4)

* Relative Risk, adjusted for sex, age and smoking

Further studies

297 never smoker (started November 08):

- Serum, plasma and cells
- Methacholine challenge test
- Exhaled breath condensate
- Peripheral blood lymphocytes



Preliminary Conclusions

The fishermen who participated in clean-up activities of the Prestige oil spill show persistent respiratory symptoms more than 5 years after exposure.

