

Public Responses to a Nuclear Reactor Emergency: Results from a Survey in Spain

C. Oltra
R. Sala
S. Germán
S. López



Public Responses to a
Nuclear Reactor
Emergency: Results from
a Survey in Spain

C. Oltra

R. Sala

S. Germán

S. López

Toda correspondencia con relación a este trabajo debe dirigirse al Servicio de Información y Documentación, Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas, Ciudad Universitaria, 28040-MADRID, ESPAÑA.

Las solicitudes de ejemplares deben dirigirse a este mismo Servicio.

Para describir las materias que contiene este informe con vistas a su recuperación, los descriptores se han seleccionado del *Thesauro* del DOE. La catalogación y la clasificación se han hecho de acuerdo, respectivamente, con los documentos *DOE/TIC-4602 (Rev. 1) Descriptive Cataloguing On-Line* y *DOE/TIC.4584-R7 Subject Categories and Scope*, ambos publicados por el Office of Scientific and Technical Information del Department of the Energy de Estados Unidos.

Se autoriza la reproducción de los resúmenes analíticos que aparecen en esta publicación citando la fuente.

Catálogo general de publicaciones oficiales
<http://www.060.es>

Depósito Legal: M-26385-2011
ISSN: 1135-9420
NIPO: 058-18-017-4

Publicación incluida en el programa editorial del suprimido Ministerio de Economía, Industria y Competitividad y editada por el Ministerio de Ciencia, Innovación y Universidades (de acuerdo con la reestructuración ministerial establecida por Real Decreto 355/2018, de 6 de junio)

Editorial CIEMAT

CLASIFICACIÓN DOE Y DESCRIPTORES

S29

ATTITUDES; EMERGENCY PLANS; PUBLIC OPINION; REACTORS; SPAIN;
SOCIAL IMPACT; BEHAVIOR; RADIATION HAZARDS

**Public Responses to a Nuclear Reactor Emergency:
Results from a Survey in Spain**

Oltra, C.; Sala, R.; Germán, S. & López, S.
46 pp., 2 refs., 16 figs., 8 tables

Abstract:

This report analyses data from a survey study aimed at studying the attitudes and behavioural intentions regarding a potential nuclear emergency of the population living close to a nuclear power plant (0-30 km and 30-100km). We examine residents' beliefs about a number of self-protective actions (sheltering, evacuation, etc.) as well as other dimensions regarding risk perception, trust and knowledge. We find the existence of significant levels of potential overreaction after a nuclear accident by the residents living within 100km around a nuclear power plant together with a low level of public trust in the operation of nuclear power plants and a general lack of awareness about the potential actions to carry out in case of a nuclear accident.

Reacciones Públicas ante Emergencias Radiológicas en España

Oltra, C.; Sala, R.; Germán, S. y López, S.
46 pp., 2 refs., 16 figs., 8 tablas

Resumen:

Este informe analiza los datos de un estudio realizado para estudiar las actitudes y las intenciones de comportamiento en relación a una potencial emergencia nuclear de los habitantes de municipios cercanos a una central nuclear (0-30 km y 30-100 km). Examinamos las creencias de los individuos sobre diferentes acciones de auto-protección (confinamiento, evacuación, etc.), así como otras dimensiones relacionadas con la percepción del riesgo, la confianza y el conocimiento. Observamos la existencia de niveles significativos de potencial sobre-reacción después de un accidente nuclear por parte de los residentes que viven en un radio de 100 km alrededor de una central nuclear junto con un bajo nivel de confianza pública en la operación de plantas de energía nuclear y una falta general de conocimiento sobre las posibles acciones para llevar a cabo en caso de un accidente nuclear.

Public responses to a nuclear reactor emergency:

Results from a survey in Spain

EJP- CONFIDENCE PROJECT

Task 5.2.1. Socio-psychological study of understanding, processing and management of uncertainties and improved communication tools.

Christian Oltra, Roser Sala, Silvia Germán and Sergi López

CISOT-CIEMAT

March 2018



This project has received funding from the Euratom research and training programme 2014-2018 under grant agreement No 662287.

This publication reflects only the author's view. Responsibility for the information and views expressed therein lies entirely with the authors. The European Commission is not responsible for any use that may be made of the information it contains.

Abstract

This report analyses data from a survey study aimed at studying the attitudes and behavioural intentions regarding a potential nuclear emergency of the population living close to a nuclear power plant (0-30 km and 30-100km). We examine residents' beliefs about a number of self-protective actions (sheltering, evacuation, etc.) as well as other dimensions regarding risk perception, trust and knowledge. We find the existence of significant levels of potential overreaction after a nuclear accident by the residents living within 100km around a nuclear power plant together with a low level of public trust in the operation of nuclear power plants and a general lack of awareness about the potential actions to carry out in case of a nuclear accident.

Keywords: public responses, attitudes, beliefs, radiological emergencies.

Resumen

Este informe analiza los datos de un estudio realizado para estudiar las actitudes y las intenciones de comportamiento en relación a una potencial emergencia nuclear de los habitantes de municipios cercanos a una central nuclear (0-30 km y 30-100 km). Examinamos las creencias de los individuos sobre diferentes acciones de auto-protección (confinamiento, evacuación, etc.), así como otras dimensiones relacionadas con la percepción del riesgo, la confianza y el conocimiento. Observamos la existencia de niveles significativos de potencial sobre-reacción después de un accidente nuclear por parte de los residentes que viven en un radio de 100 km alrededor de una central nuclear junto con un bajo nivel de confianza pública en la operación de plantas de energía nuclear y una falta general de conocimiento sobre las posibles acciones para llevar a cabo en caso de un accidente nuclear.

Palabras clave: respuestas públicas, actitudes, creencias, emergencias radiológicas.

Index

INTRODUCTION	3
METHOD	3
RESULTS	5
SUMMARY OF RESULTS	24
REFERENCES	26
ANNEX I. RESULTS BY SOCIODEMOGRAPHICS	27
ANNEX II. QUESTIONNAIRE.....	34

Introduction

Any comprehensive emergency response plan involving evacuation or sheltering of the population or any other protective measure must consider the potential reactions of the residents living within the closest radius to a power plant. Will residents overreact or underreact after a nuclear emergency? How likely is that they would follow the instructions by the authorities? This report analyses the data from a survey study aimed at measuring risk perceptions and self-reported protective behaviour regarding a potential nuclear emergency among residents living next to a nuclear power plant in Spain.

Based on previous research in this area (Johnson Jr and Zeigler, 1983; Johnson Jr, 1985) we designed and implemented an online questionnaire to collect data on attitudes and behavioural intentions regarding the possibility of a nuclear emergency. We focused on residents living within two areas around a nuclear power plant: 0-30 km and 30-100km. We were specifically interested in measuring and explaining what actions are more likely to be carried out by residents in response to a nuclear emergency. We also measured residents' beliefs about these actions as well as other dimensions regarding risk perception, trust and knowledge.

In the following pages, we provide the details of the method of the study and analyse the main descriptive and correlational results for the studied variables.

This study is part of Task 5.2 *Socio-psychological study of understanding, processing and management of uncertainties and improved communication tools* of the EJP (European Joint Programme for the Integration of Radiation Protection Research) funded Confidence project (H2020 grant agreement 662287 – CONCERT).

Method

Questionnaire

The questionnaire (see Annex II) was designed by researchers working on Task 5.2 *Socio-psychological study of understanding, processing and management of uncertainties and improved communication tools* from previous studies reviewed in deliverable "Social, ethical and communication aspects of uncertainty management". The questionnaire was structured to measure variables around the following constructs:

- Risk perception
- Attitude towards science and technology
- Attitude towards nuclear energy
- Trust in the management of nuclear technology
- Behaviour in emergency situations
- Perception of information
- Trust in information sources

- Knowledge
- Experience

Sample

A total of 808 individuals living within an area of 1 to 100km around a nuclear power plant participated in the survey. Respondents were recruited from online panels by a market research company operating in Spain. A first sample of 302 participants was selected from online panellists living within an area of less than 30km around one of the five operating Spanish nuclear power plants (Vandellós, Ascó, Cofrentes, Trillo and Almaraz). A second sample of 506 participants was recruited from panellists living within an area of 30 to 100km around one of these power plants. This second area was stratified in two areas: 30-65km and 65-100km. A disproportionate stratified sampling was adopted to avoid an excessive representation of residents in big capitals in the sample. Soft-quotas were introduced to control for gender, age and education. Data was collected in November 2017 and January 2018. The main demographic characteristics are shown in Table 1.

Table 1. *Characteristics of the study sample*

	<30km	30-100km
Women	59%	47%
Men	41	53
Age (Mean)	39 years	46 years
Education		
Primary	4%	4%
Secondary	6	9
High school	16	16
Technical degree	14	14
Technical degree	19	17
sup.		
University degree	41	40
Total (N)	302	506

Analysis

We carry out descriptive analyses for the main studied variables. Also bivariate analyses (contingency tables and Chi-square tests) with area of residence as independent variable are carried out. Finally, we carry out two regression analysis with reaction after a nuclear emergency as dependent variable and a number of independent factors.

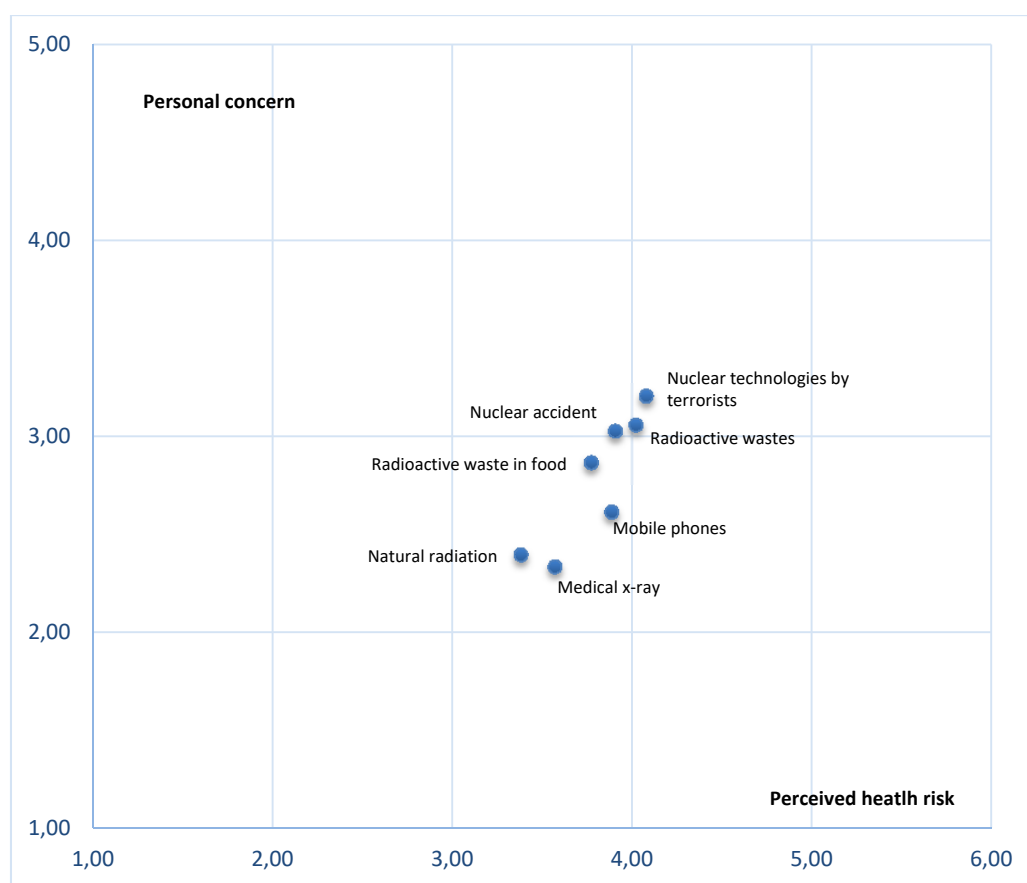
Textual data from the open questions of the questionnaire were analysed with thematic content analysis. MAXQDA 12 software was used.

Results

Risk perception

Respondents have, on average, a moderate perceived health risk ($M = 3.8$ in a 1-6 scale) of the various sources of radiation and a medium level of personal concern about these sources. Figure 1 displays the level of perceived health risk (scale 1 to 6) and personal concern (scale 1 to 5) for seven sources of radiation. In the upper right section we find those sources that generate a higher level of perceived risk and personal concern: use of nuclear technology by terrorists, radioactive wastes and a potential nuclear accident. On the other hand, natural radiation generates a lower level of perceived risk and of concern.

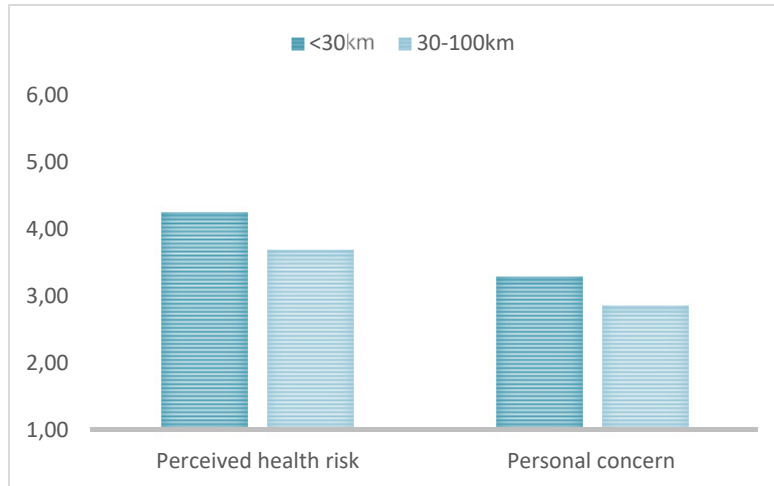
Figure 1. *Perceived health risk and personal concern about various sources of radiation (average, scale 1 to 6 for perceived risk and 1 to 5 for personal concern)*



If we focus on the perception of a potential accident in a nuclear installation, we find significant differences between individuals living in the 30km area within a nuclear power plant and individuals living in the 30-100km area (Figure 2). Specifically, those living closer to a nuclear power plant report a higher level of perceived health risk (4.25

vs 3.70) and a higher level of personal concern about the risk (3.29 vs 2.87). The differences are weak to moderate and statistically significant.

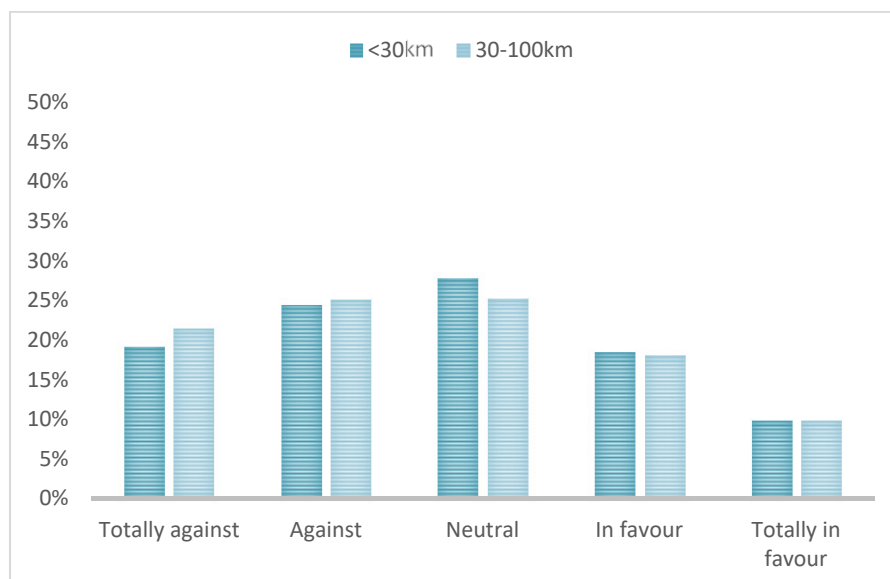
Figure 2. *Perceived health risk and personal concern regarding an accident in a nuclear installation (average; scale 1 to 6 for perceived risk and 1 to 5 for personal concern)*



Prior attitudes

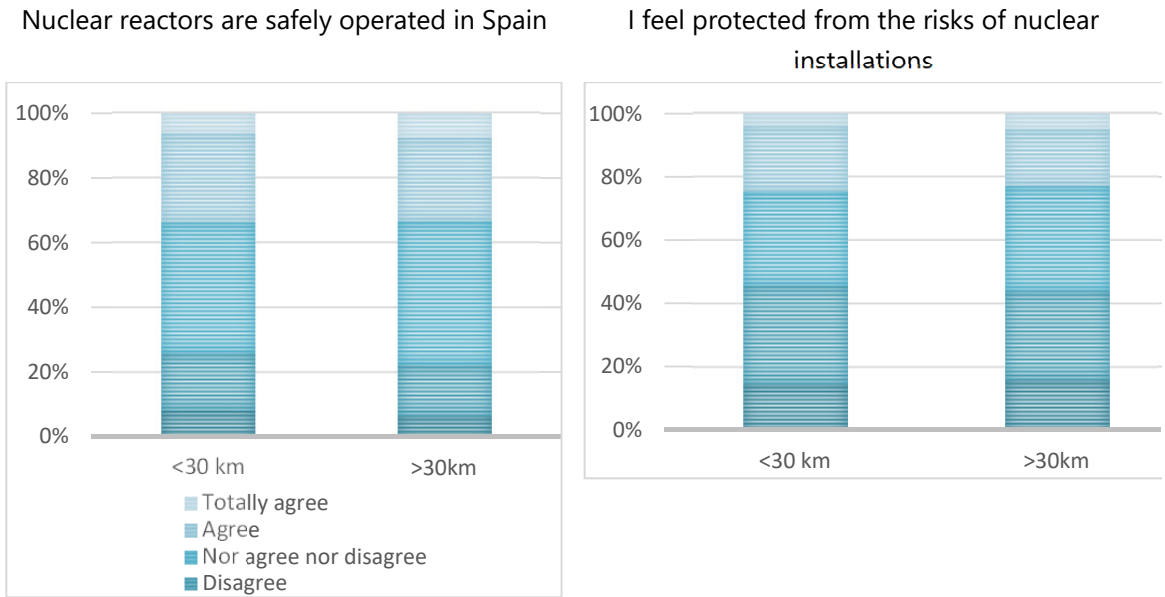
The public attitude towards nuclear energy in the studied population is neutral to negative ($M = 2.72$ in a 1 to 5 scale). However, there is an important level of variation within the sample: around 45% of respondents is against nuclear energy, 26% is neutral and 28% is in favour of nuclear energy (Figure 3). So, only 3 out of 10 respondents have a positive attitude towards nuclear energy. There is no significant difference between our two samples in terms of the attitudes towards nuclear energy. In both studied areas, the majority of participants report a negative to neutral attitude towards nuclear energy.

Figure 3. *Attitude towards nuclear energy in both studied areas (as % of respondents)*



We also asked participants whether they considered that nuclear reactors are safely operated in Spain and whether they feel protected from the risks of nuclear installations. Figure 4 shows that only around 33% of respondents in both samples think that nuclear reactors are operated safely in Spain. The majority of respondents (43%) have a neutral or undecided position in this regard.

Figure 4. *Trust in the operation of nuclear reactors (as % of respondents)*



We also asked respondents how protected they feel about the risks from a nuclear installation. Only 24% of participants report feeling very safe against the potential risks from nuclear installations. A majority of respondents in both samples (45%) feel somehow unsafe about the risks of nuclear installations. Trust in the operation of nuclear reactors and feelings of safety do not differ significantly between residents living within 30km from a nuclear power plant and residents in the 30-100km area. As shown in the figure above, the percentages of respondents that trust the operation of nuclear reactions and that feel protected from the potential risks from nuclear reactors is almost identical in both areas (33-34% and 25-23% respectively).

Perceived distance to a nuclear power plant

Perceived distance to a nuclear power plant is another relevant dimension of individuals’ perception, given its potential influence on attitudes and behaviours regarding a nuclear reaction emergency (see section on correlates of behavioural intentions).

The data in Table 2 shows that between 7 and 22% of respondents is not aware of the approximate distance of their home to the closest nuclear power plant. This percentage

is significantly higher in some of the studied populations (e.g. population around Trillo). This could reflect the actual distance to the power plant but also reflect the psychological distance between the population and the nuclear power plant. In Ascó, for instance, 18% of the surveyed population living within the 30-100km area consider themselves as living more than 100km from the power plant. This percentage increases up to 35% in Cofrentes and Trillo. On the contrary, the population reporting living within 11 to 30 km from the power plant goes from 10% in Ascó to 2% in the other studied populations.

Table 2. *Perceived distance to a nuclear power plant by studied population (in % of respondents)*

							Total
		ASCÓ	VANDELLÓS	COFRENTES	TRILLO	ALMARAZ	
	0-10 km	1%	1%	1%	1%	1%	1%
	11-30 km	10	2	2	2	1	3
	31-50 km	21	19	13	13	11	15
	51-100 km	40	44	36	27	40	37
	>100 km	18	27	37	35	32	30
	Dk	10	7	11	22	15	13
Total		100%	100%	100%	100%	100%	100%

First concerns after an emergency

Imagine that you have just heard the news that an accident has occurred at the nuclear power station closest to your residence and the radioactivity has been released into the environment.

We presented this scenario to interviewees and asked them, in an open-ended question, what would be their first concern in this situation. A qualitative analysis with MAXQDA was carried out for the Spanish responses. We got a total of 821 responses because some people gave more than one answer. The analysis revealed the existence of different categories of first worries in the Spanish sample.

If we take into account the whole sample, the most frequently mentioned concern is related to the risks, cited in 221 occasions (27% of the responses). If we look into this category we found three different concerns related to:

- Risk for health (for myself or my family and friends) "my health" or "to fall ill" "Effects for health that this radioactivity may suppose". Fatalistic view emerges in this subcategory: "I have no escape" or "I am going to die"

- Risk for the society "My concern would be that the people would be very damaged"
- Risk for the environment

The second most important concern seems to be people (24% of the responses). In this category three main subcategories emerged:

- My family
- My children
- The people

The third category is those aspects related to the situation or the event characteristics (short term impact) and represented the 16% of the responses given. In this category we find different kind of responses:

- Those who said only "radioactivity" or some similar word such as "the radioactive cloud"
- Those worried about the scope or the magnitude of the event: "that radioactivity arrives to my town"
- Those worried about other characteristics of the event such as the direction of the wind: "Observe the direction of the wind to know where the radioactivity can go" or "I will see the weather conditions"

A fourth category is related to the protection actions (8% of the responses). In this category we found:

- Concerns directly asking "what to do?"
- Those who will try to find a secure place ""How to get safe"
- Those who will stay at home and close windows and doors
- Those who will evacuate (5% of the whole sample)

Competent authorities and media are the main authors cited in these responses, as responsible of giving information to the people. Another category is those responses that said "None" or "Don't know" (4%). No mentions were found to iodine tablets. Finally there are some residual categories:

- Other issues (3%) that includes responses such as "explosion" or "terrorist attack"
- Emotions (2%) that cited mainly worry and fear
- Contact people (2%) including those responses that highlight the need to contact with family and kids.
- Social impact (1'6%) that includes those responses highlighting the social impacts of the accident ""Contact the family" or ""Know where my family is"

- Compliance with instructions (1%) including those responses dealing with the need to follow the instructions given by the authorities “Do what the authorities say”

If we compare the two samples (those living in the area within 30km to a power plant and those living in the area between 30 and 100km) for the main responses categories (Table 3), we find that the responses dealing with risk, people or short term impact are more common in the sample living in the area within 30 km to a power plant while the responses dealing with protection, request for information or “None /Don’t know” are more common in the sample living in the area between 30 and 100 kms.

Table 3. Percentages of responses for each main code by sample

Code	<=30 km	>30 km
Risk	29%	26%
People	26	23
Short term impact	11	8
Protection	6	9
Information	3	6

Behaviour in emergency situations

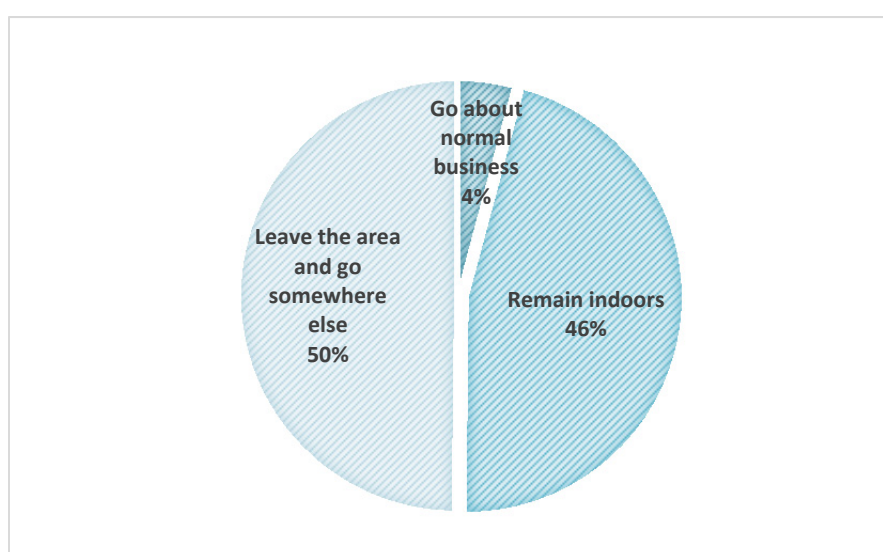
In order to measure overreaction, we asked participants to imagine (**scenario 1**) that there has been an accident in the nuclear power plant closest to their home. The authorities have advised residents living closest to the power plant to remain indoors, but actions are not needed in the area of the participant. Table 4 shows the percentage of respondents that would go about their normal business (follow instructions), would stay inside their home or would leave their home and go somewhere else. The data show that only 12% of respondents living in the area within 30km to a power plant and 21% of those living in the area between 30 and 100km would follow directions during an emergency at their closes nuclear power plant. Around 40% of respondents in both areas think that would remain indoors; and 40% that would leave the area. Overreaction is slightly higher among residents living within 30km around a nuclear power plant. The difference between both areas is weak but statistically significant ($p=0.00$)

Table 4. *Reaction to scenario 1 by studied area (in % of respondents)*

		Area	
		< 30 km	30-100km
	Go about normal business	12%	21%
	Remain indoors	44	43
	Leave the area and go somewhere else	44	36
Total		284	461
		100%	100%

In **scenario 2**, everyone living within 30 km of the nuclear power plant is advised to remain indoors (sheltering). Around 45% of respondents living in the area would follow instructions (Figure 5). Half of respondents would overreact, by leaving the area and going somewhere else (50%).

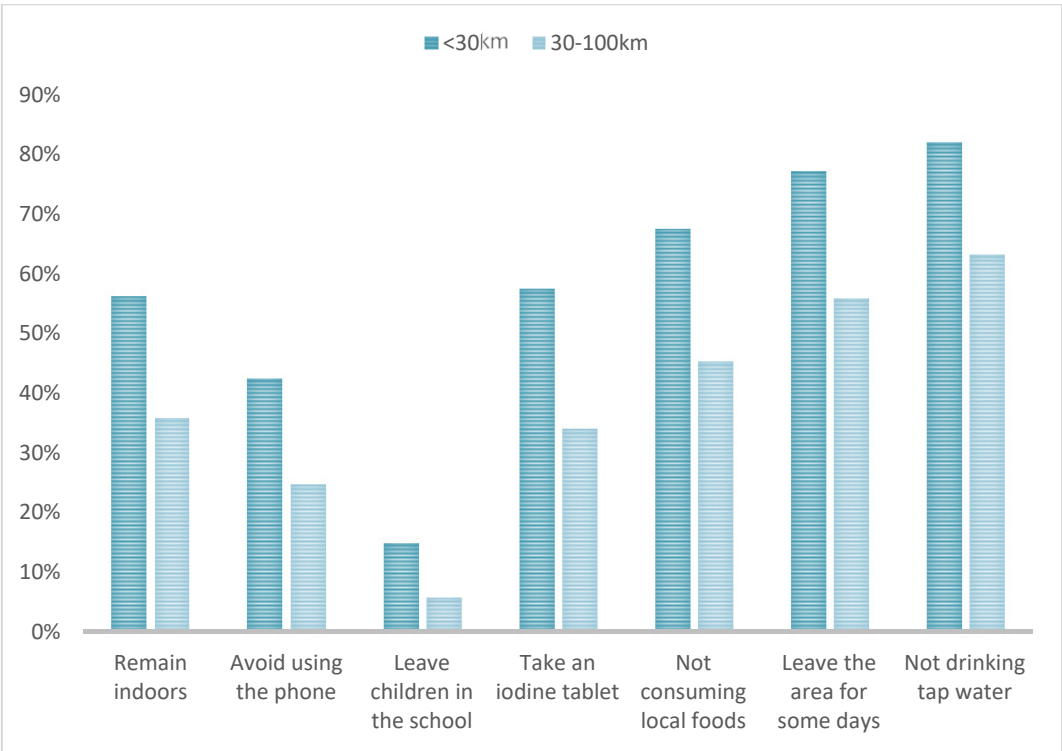
Figure 5. *Reaction to scenario 2 (as % of respondents)*



In order to measure the percentage of the population that would follow the specific actions advised by the authorities, we presented a number of potential actions. Figure 6 shows the self-reported likelihood of following a proposed action. The results show that the majority of respondents, especially those living in the area within 30 km to the nuclear power plant, would probably or definitively act as advised by authorities. Not drinking water from the tap and abandoning the area would be probably followed by more than 75% of respondents in the area within 30km to a power plant and by around 60% of respondents living in the 30-100km area. A lower percentage of respondents would not consume local foods (68%; 45%), remain indoors (56%; 36%), take an iodine tablet (58%; 34%) or avoid using the phone (42%; 25%) if advised. Leaving children in

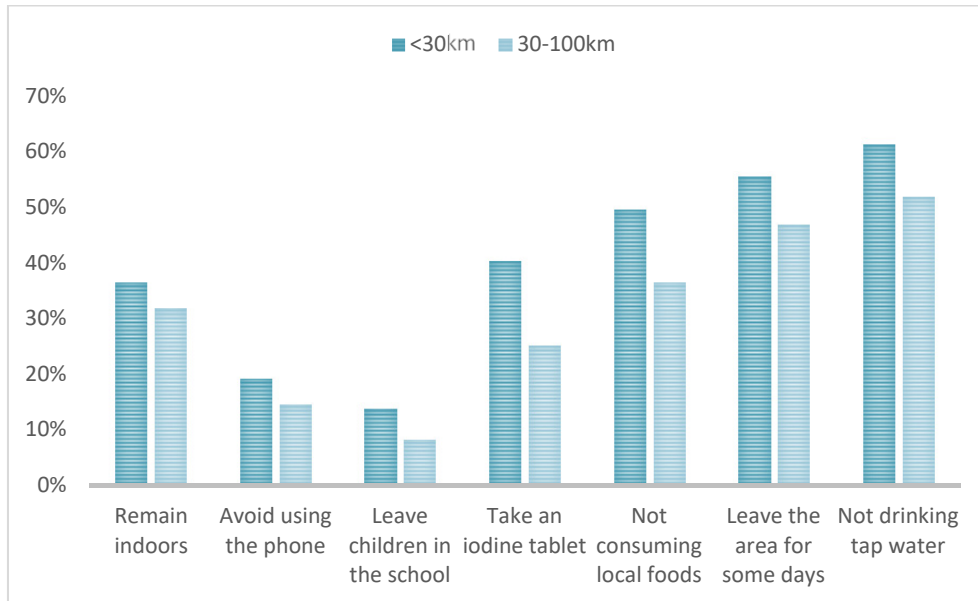
the school would probably be followed by less than 20% of participants. The differences between residents living in both areas are moderate to medium and statistically significant.

Figure 6. *Self-reported likelihood of following a number of actions (as % of respondents who consider it likely and very likely)*



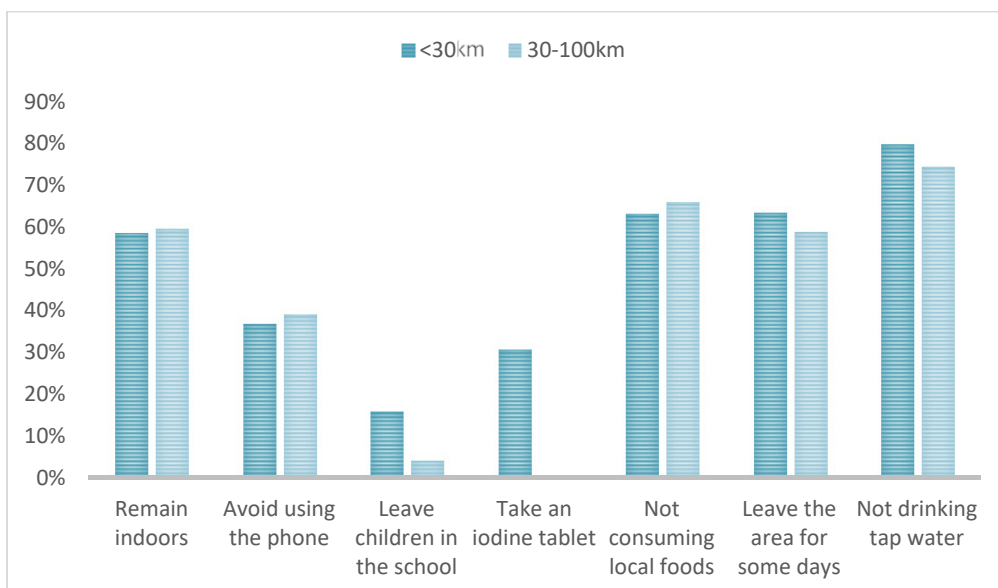
When participants are asked if they think the majority of people living in the area would follow these actions, they tend to think that it is less likely that people would follow the actions (Figure 7). For instance, while 58% of participants in the area within 30 km to the nuclear power plant report that they would probably or definitively take an iodine tablet, only 40% believe that their neighbors would probably or definitively take an iodine tablet. The actions that are perceived as more likely to be carried out by the neighbors are also the actions that respondents consider more likely to be carried out by them. There are significant differences between both populations.

Figure 7. Perception of the likelihood that other residents follow a number of actions (as % of respondents who consider it likely and very likely)



How easy or difficult participants consider it is to carry out the proposed actions? As shown in the following figure (Figure 8), a majority of participants consider easy or very easy to not drink tap water, to leave the house, to avoid consuming local food and to remain indoors for a whole day. Avoiding using the phone, leaving the children in the school or taking an iodine table are perceived as more difficult actions. Differences between respondents in the two areas are very weak, except for taking an iodine table: 31% of participants in the area within 30 km from a power plant consider it easy or very easy, versus 0% in the area within 30 to 100km from a power plant.

Figure 8. Perception of how easy to follow respondents consider a number of advised actions (as % of respondents who consider it easy or very easy)



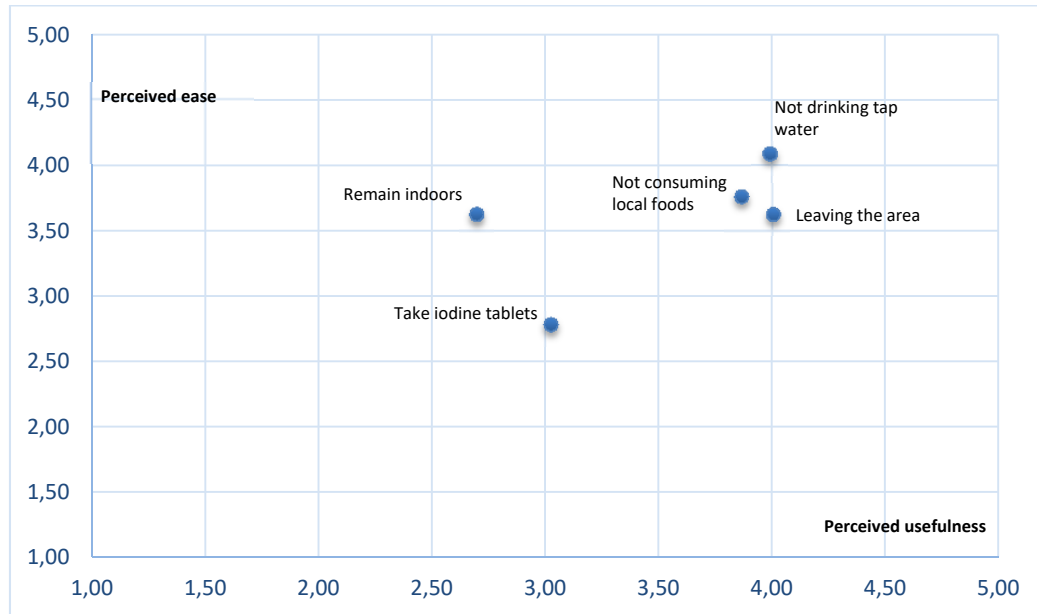
Finally, we asked participants how effective they think the proposed actions would be to protect them from the effects of a radioactive leak. The majority of participants (around 70%) consider very or totally effective to leave the area, to avoid consuming local products and to not drink tap water (Figure 9). Taking an iodine tablet and remaining indoors are considered less effective actions by the majority of participants. The differences between residents living in the two studied areas are very weak to non-relevant.

Figure 9. *Perception of the effectiveness of a number of advised actions (as % of respondents who consider it quite or totally useful)*



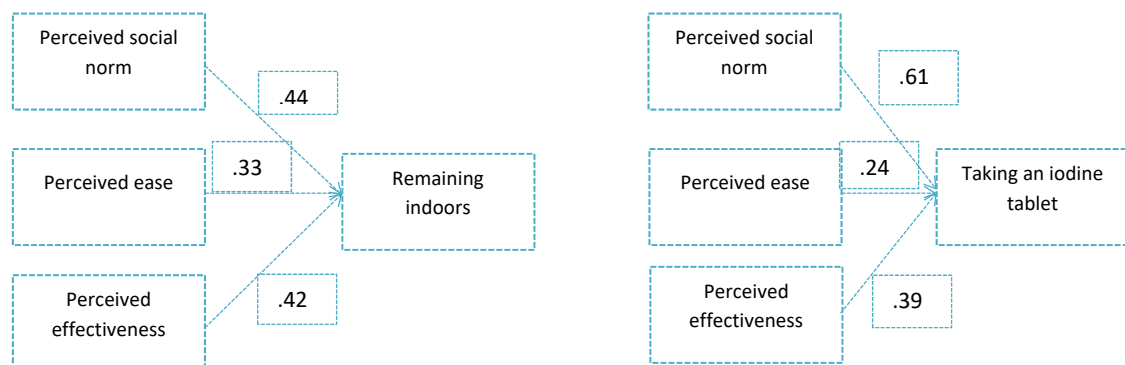
If we consider the proposed actions in terms of the perceived usefulness and the perceived ease of carrying it out, there are three actions that are generally considered by respondents as easy and useful: avoiding local products, leaving the area and avoiding drinking tap water (Figure 10). Staying indoors is perceived, on average, as easy but less effective. Taking an iodine tablet is perceived as not too easy and only moderately effective.

Figure 10. *Perceived usefulness and perceived ease of following the advised actions (scale 1 to 5)*



There is a significant correlation between the self-reported probability that participants would follow the advised actions and whether they belief their neighbors would follow them, the perceived ease of carrying out the action and the perceived effectiveness of the action. Figure 11 displays the correlation coefficient between the probability of following the advised actions after a radiological emergency and the other three variables for two specific actions: remaining indoors and taking an iodine tablet. The perceived social norm is the factor most strongly associated with the probability of following the action. The strength of this association is higher for taking an iodine tablet. Perceived effectiveness of the action and perceived ease of following the action are also significantly associated to the self-reported probability of following the action.

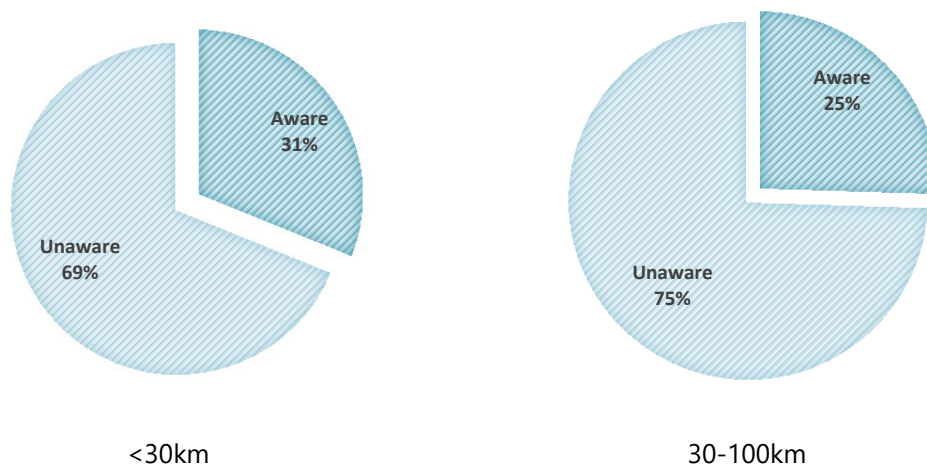
Figure 11. *Correlations between perceived social norm, perceived usefulness and perceived ease of following an advised action (Spearman rho)*



Iodine tablets

The majority of the population in both areas is unaware of the existence of iodine tablets: only 27% of respondents are aware of the existence of these tablets. This percentage varies between 31% among the residents living within 30km to a power plant and 25% among the residents living within a 30-100km distance to a power plant (Figure 12). The difference between both samples is not statistically significant. Both populations are generally unaware of the use of iodine tablets in nuclear emergencies.

Figure 12. *Awareness of the existence of iodine tablets (as % of respondents)*



The majority of the surveyed population is also unaware of where to find or buy iodine tablets. Among the residents in the 30km area around a nuclear power plant, 60% of participants in the study report that they do not know how to obtain an iodine tablet. The majority of participants (82%) in the 30km area around a nuclear power plant do not know whether these tablets are free or not.

The majority of respondents (60%) in the 30-100km area would like to have iodine tablets at home. But a significant 40% of respondents would not like to have an iodine tablet at home. This percentage correlates significantly with perceived distance to a nuclear power plant.

The majority of participants (around 50%) in both areas do not know what these tablets are useful for. Around 35% of respondents think they might protect against any effect from radiation.

Table 5. *When should you take the iodine tablet (as % of respondents)*

	Area	
	<30 km	>30km
Immediately: As soon as you know that has been an accident or when you hear the sirens	18%	15%
When the authorities recommend it officially	24	34
Two hours after the alarm	,3	1
Other (specify)	,0	,4
DK	57	49
Total	100% (302)	100% (506)

Finally, the majority of respondents in both areas (57 and 48% respectively) do not know when an iodine tablet should be taken (Table 5). Of those who provide an answer, only between 18 and 15% think that iodine tablets should be taken immediately after an accident. 24% of respondents in the area within 30km to a nuclear power plant and 34% of respondents in the area within 30-100km around a power plant think that iodine tablets should be taken when recommended by the authorities.

Correlates of behavioral intention

In order to understand who is more likely to overreact in case of a nuclear emergency, we run two regression models with reaction to the proposed scenarios (with three answer categories: go about their normal business, stay inside their home or leave their home and go somewhere else) as the dependent variable and a number of independent variables of interest: sex, age, years living in the area, risk perception from a nuclear accident, trust in the management of nuclear power plants, self-perceived level of information, knowledge, experience and perceived distance to a nuclear power plant.

Among residents living in an area within 30km around a nuclear power plant, only sex and level of knowledge are significantly associated ($p < 0.05$) with overreaction (Table 6). Men ($OR = 2.00$) are more likely than women to report that they would abandon the area in case of a nuclear emergency when authorities have advised to remain indoors. Those who think that radiation always produces radioactive contamination are also significantly more likely ($OR = 2.14$) to overreact. Other correlates that almost reach statistical significance ($p < 0.10$) are risk perception and self-perceived level of information. Specifically, those respondents that perceive that an accident in a nuclear installation poses a very low risk are less likely ($OR = 0.38$) to abandon the area. Also those participants that feel somehow well informed about what to do in case of an accident are less likely ($OR = 0.29$) to overreact.

Table 6. *Multivariate odd ratios for "leaving the area" (<30km)*

	Odd ratio	Sig.
Men	2,006	,017
Women	.	.
18-34	1,503	,570
35-44	1,111	,883
45-64	1,718	,451
>65	.	.
Years in the area		
0-10	1,522	,192
11-20	1,519	,261
>20	.	.
Risk perception		
No risk	1,893	,435
2	,387	,060
3	,546	,178
4	,697	,356
5	,680	,316
Very high risk	.	.
Trust in management		
No trust	1,186	,581
Trust	.	.
Feeling of being informed		
Nothing	,496	,225
Somehow	,298	,065
Yes	.	.
Knowledge		
[AW1=1]	2,142	,020
[AW1=2]	1,845	,094
[AW1=9]	.	.
Experience		
Yes	1,174	,593
No	.	.
Perceived distance to a NPP		
0-10 km	,487	,503
11-30 km	2,024	,428
31-50 km	1,386	,709
51-100 km	,784	,788
More than 100 km	1,437	,753
Do not know	.	.

When we run the analysis for the total sample for Scenario 1, the effect of the independent variables varies significantly (Table 7). Variables significantly associated with overreaction in Scenario 1 for the total sample are risk perception and perceived distance to the nuclear power plant. Those respondents that perceive that an accident in a nuclear installation poses a very low risk are less likely (OR= 0.32) to abandon the area. Participants that think that they live within 11-30 km around a nuclear power plant are also more likely to overreact (OR= 5.2). Participants that do not know the distance of their house to the nuclear power plant are the less likely to overreact.

Table 7. *Multivariate odd ratios for "leaving the area" (total sample)*

	Odd ratio	Sig.
Men	1,225	,389
Women	.	.
18-34	,865	,731
35-44	1,200	,670
45-64	,812	,601
>65	.	.
Years in the area		
0-10	1,015	,958
11-20	1,253	,473
>20	.	.
Risk perception		
No risk	,356	,047
2	,327	,006
3	1,226	,586
4	1,182	,636
5	,939	,862
Very high risk	.	.
Trust in management		
No trust	1,548	,081
Trust	.	.
Feeling of being informed		
Nothing	,921	,835
Somehow	1,065	,896
Yes	.	.
Knowledge		
[AW1=1]	1,618	,090
[AW1=2]	1,004	,991
[AW1=9]	.	.
Experience		
Yes	,973	,914
No	.	.

Perceived distance to a NPP		
0-10 km	2,365	,309
11-30 km	5,218	,001
31-50 km	3,930	,003
51-100 km	2,723	,022
More than 100 km	2,361	,061
Do not know	.	.

Perception of information

We asked respondents whether they felt that they are well informed about what to do in a case of nuclear accident. As shown in Table 8, the majority of participants in both areas feel uninformed about the potential actions to carry out in case of a nuclear emergency. Specifically, around 75% of respondents disagree with the statement: "I feel well informed about what to do in a case of a nuclear accident". The differences between residents in both studied areas are non-significant.

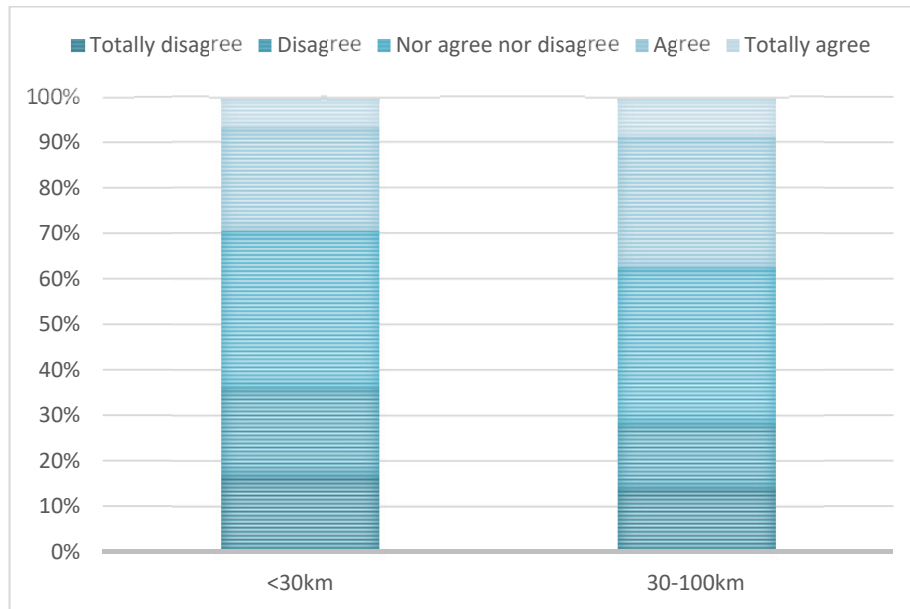
Table 8. Level of agreement with the statement "I feel well informed about what to do in a case of a nuclear accident" (as % of respondents)

	Area	
	<30 km	>30km
Totally disagree	45%	49%
Disagree	31%	25%
Nor agree nor disagree	7%	15%
Agree	3%	6%
Totally agree	4%	4%
Total	100%	100%
	302	506

Respondents are more positive about the possibility of becoming informed if there was an accident. To measure the level of hope or trust in becoming informed if an accident in the closest power plant happened, we asked respondents their level of agreement with the statement: "I trust that in case of a nuclear accident I would find the information needed to protect myself". As shown in Figure 13, the majority of respondents are undecided (34%) or belief that they would not find the information needed to protect themselves (around 30%). The percentage of respondents that trust that they would find information to protect themselves is around 30%. Optimism seems to be slightly higher in the population within the area of 30-100km to a power plant, where 38% of respondents agree that they would find the information needed to protect themselves, versus 30% in the area within 30km to a power plant. But the

difference is not statistically significant and it is likely due to the different distribution of men and women in both samples.

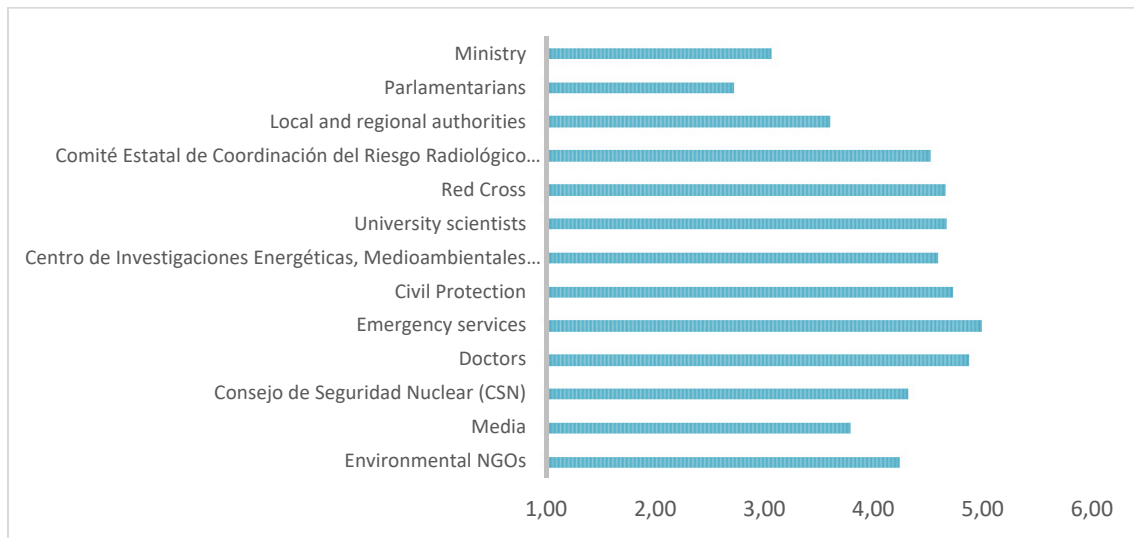
Figure 13. *Belief that respondents would find information to protect themselves (as % of respondents)*



Trust

Level of trust in the different actors to provide accurate information regarding a nuclear accident is generally medium to high in the total sample. On average, emergency services (M= 4.99), doctors (4.86), civil protection (4.72), university scientists (4.66), Red Cross (4.65) are the most trusted sources of information (Figure 14). The National Nuclear Security Council obtains a 4.3, a very similar value to environmental NGOs (4.2). The media (3.78), local authorities (3.60), parliamentarians (2.72) and the Ministry (3.06) obtain the lowest levels of public trust. Differences between the two studied populations are almost non-relevant.

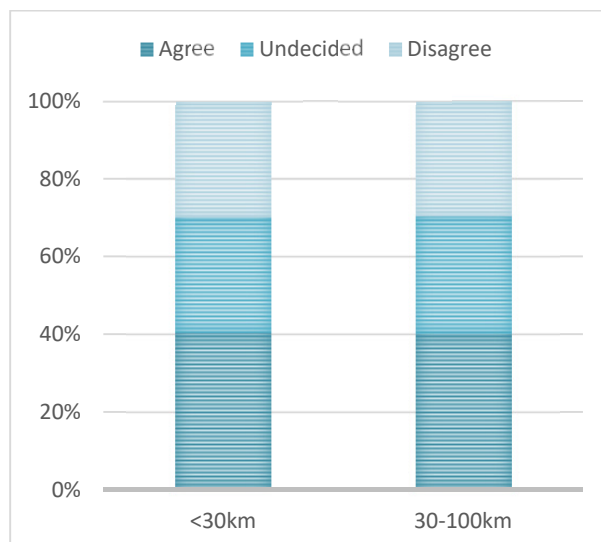
Figure 14. *Level of trust in actors to provide objective information (average, scale 1 to 6)*



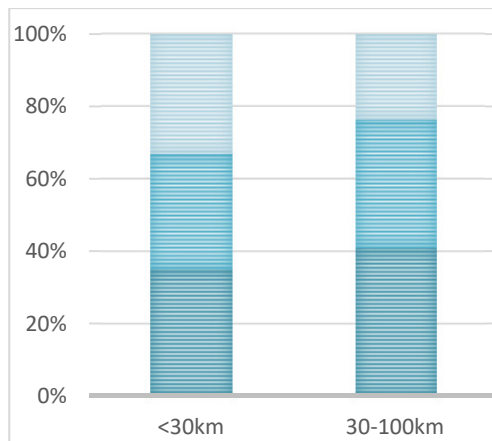
Knowledge

To measure the level of knowledge regarding radiological contamination of the population living close to a nuclear power plant, we asked participants a number of questions. First, do respondents believe that exposure to radiation always produces radioactive contamination? Figure 15 shows that 40% of respondents consider that exposure always leads to contamination; 30% of respondents are unsure about this; and only 30% are aware that exposure does not necessarily produce contamination. There are no differences between the two studied populations.

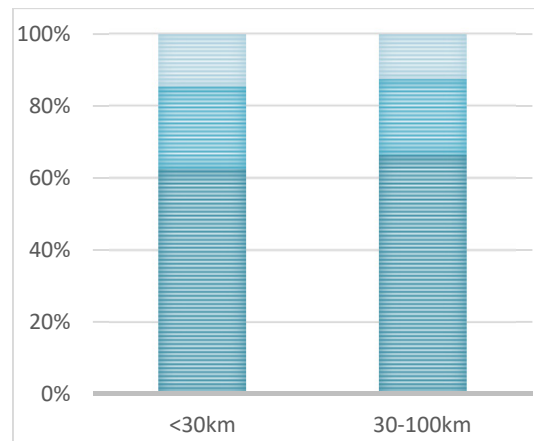
Figure 15. *Agreement with the following statements (as % of respondents)*



"Exposure to radiation always produces radioactive contamination"



"Vegetables that have growth close to a nuclear power plant are good or bad to human consumption due to radioactivity"



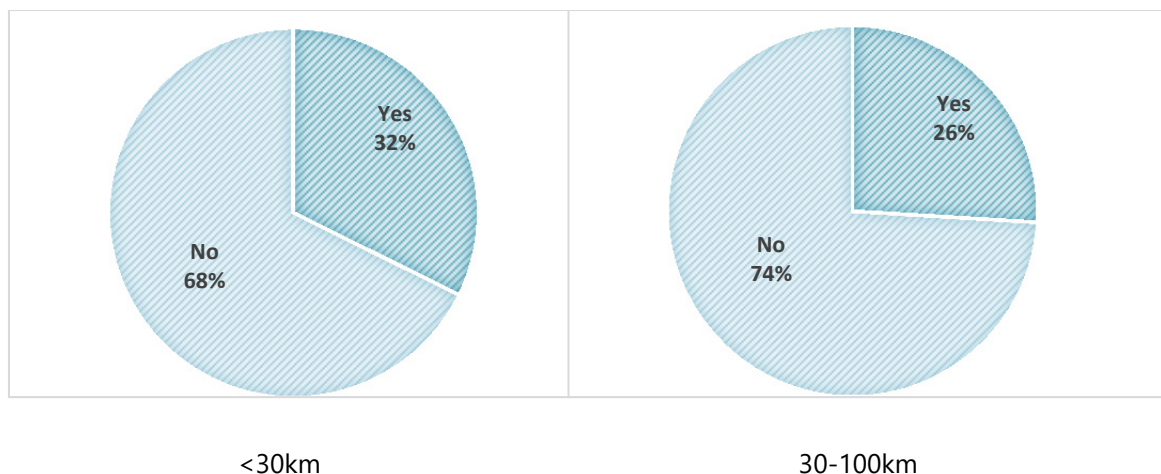
"Low levels of radiation due to an accident are dangerous for human health"

We also asked respondents if they believed that the vegetables that have growth close to a nuclear power plant are good or bad to human consumption due to radioactivity. 35% of respondents in the area within 30km to the nuclear power plant and 41% in the area within 30-100km believe that vegetables are not good for human consumption. Regarding the impact of radiation on human health, 63% of respondents in the area within 30km to the nuclear power plant and 66% in the area within 30-100km believe that even low levels of radiation due to an accident are dangerous for human health. Only between 12 and 15% believe in both samples belief that low levels of radiation are not dangerous for human health.

Experience

Around 30% of the total sample has visited a nuclear power plant. As shown in Figure 16, the percentage of respondents who have visited a nuclear power plant is slightly higher in the population living within 30km to a power plant (32 vs 26%). The difference between both studied populations is very weak but statistically significant ($p=0.05$)

Figure 16. Percentage of respondents who have visited a nuclear power plant (% of resp)



Summary of results

The analysis of the survey data shows that:

- Respondents have, on average, a moderate perceived health risk of the various sources of radiation and a medium level of personal concern about these sources. The sources that generate a higher level of perceived risk and personal concern are the use of nuclear technology by terrorists, radioactive wastes and a potential nuclear accident. Those living closer to a nuclear power plant report a higher level of perceived health risk from an accident in a nuclear installation and a higher level of personal concern about the risk than those living in the 30 to 100km area.
- In both studied areas, the majority of respondents report a negative to neutral attitude towards nuclear energy.
- Less than 30% of respondents in both populations consider that nuclear reactors are safely operated in Spain and feel safe against the potential risks from nuclear installations.
- A minority of respondents would follow directions during an emergency at their closest nuclear power plant. When advised that no actions are needed, around 4 out of ten respondents in both populations think that would remain indoors; and 4 out of 10 think that would leave the area. Overreaction is slightly higher among residents living within 30km around a nuclear power plant. When advised to remain indoors, almost half of respondents living within 30km around the nuclear power plant would follow instructions and half would overreact (by leaving the area).
- If advised by the authorities, the majority of participants would not drink tap water, would not consume local foods and would abandon the area. A lower percentage of respondents would very likely remain indoors, take an iodine tablet or avoid using the phone if advised. Leaving children in the school would probably be followed by a minority of the population. The differences between residents living in both areas are moderate to medium and statistically significant.
- There is a significant correlation between the self-reported probability that participants would follow the advised actions and whether they believe their neighbors would follow them, the perceived ease of carrying out the action and the perceived effectiveness of the action.
- The majority of the population in both areas is unaware of the existence of iodine tablets and do not know when an iodine tablet should be taken.
- Variables significantly associated with overreaction in Scenario 1 for the total sample are risk perception and perceived distance to the nuclear power plant. Among residents living in an area within 30km around a nuclear power plant

(Scenario 2), only sex and level of knowledge are significantly associated ($p < 0.05$) with overreaction.

- The majority of participants in both areas feel uninformed about the potential actions to carry out in case of a nuclear emergency. The majority of respondents are undecided (34%) or believe that they would not find the information needed to protect themselves (around 30%).
- Level of trust in the different actors to provide accurate information regarding a nuclear accident is generally medium to high in the total sample. On average, emergency services, doctors and civil protection obtain the highest level of public trust. The media, local authorities, parliamentarians and the Ministry obtain the lowest levels of public trust.
- The majority of respondents believe that low levels of radiation due to an accident are dangerous for human health. A lower level of respondents also thinks that exposure always leads to contamination. A significant part of respondents is unsure about this.

One of the main findings for the discussion of the study is the existence of significant levels of potential overreaction after a nuclear accident by residents living within 100km around a nuclear power plant together with a low level of public trust in the operation of nuclear power plants and a general lack of awareness about the potential actions to carry out in case of a nuclear accident.

References

Johnson Jr, J. H., & Zeigler, D. J. (1983). Distinguishing human responses to radiological emergencies. *Economic Geography*, 59(4), 386-402.

Johnson Jr, J. H. (1985). A model of evacuation--decision making in a nuclear reactor emergency. *Geographical Review*, 405-418.

Annex I. Results by sociodemographics

Risk perception	Total	Age				Gender		Education	
		18-34	35-44	45-64	65+	Male	Female	Non-University degree	University degree
<i>RPP2_Risk_Radioactive waste (Mean, scale 1-6)</i>	4.02	4.16	4.11	3.95	3.69	3.74	4.28	4.09	3.92
<i>RPP2b_Personal concern_Radioactive waste (Mean, scale 1-5)</i>	3.06	3.09	2.99	3.10	3.00	2.89	3.22	3.11	2.98
<i>RPP3_Risk_Mobile phones (Mean, scale 1-6)</i>	3.88	3.99	3.98	3.89	3.39	3.59	4.16	3.89	3.87
<i>RPP3b_Personal concern_Mobile phones (Mean, scale 1-5)</i>	2.62	2.68	2.57	2.66	2.43	2.42	2.79	2.61	2.63
<i>RPP5_Risk_Nuclear accident (Mean, scale 1-6)</i>	3.91	3.87	3.99	3.94	3.66	3.69	4.11	3.99	3.79
<i>RPP5b_Personal concern_Nuclear accident (Mean, scale 1-5)</i>	3.03	3.05	3.00	3.05	2.98	2.85	3.20	3.12	2.89
<i>RPP7_Risk_Natural radiation (Mean, scale 1-6)</i>	3.38	3.34	3.39	3.42	3.33	3.15	3.60	3.42	3.33
<i>RPP7b_Personal concern_Natural radiation (Mean, scale 1-5)</i>	2.39	2.37	2.33	2.45	2.43	2.23	2.55	2.50	2.23
<i>RPP8_Risk_Medical X-Ray (Mean, scale 1-6)</i>	3.57	3.34	3.63	3.71	3.50	3.38	3.75	3.63	3.48
<i>RPP8b_Personal concern_Medical X-Ray (Mean, scale 1-5)</i>	2.33	2.30	2.27	2.40	2.36	2.22	2.44	2.37	2.28
<i>RPP10_Risk_Radioactive waste in the food (Mean, scale 1-6)</i>	3.78	3.99	3.87	3.68	3.33	3.43	4.10	3.83	3.70
<i>RPP10b_Personal concern_Radioactive waste in the food (Mean, scale 1-5)</i>	2.87	3.11	2.81	2.82	2.57	2.62	3.09	2.92	2.79
<i>RPP11_Risk_Nuclear technologies by terrorists (Mean, scale 1-6)</i>	4.08	4.06	4.18	4.07	3.88	3.84	4.30	4.14	3.99
<i>RPP11b_Personal concern_Nuclear technologies by terrorists (Mean, scale 1-5)</i>	3.20	3.27	3.12	3.24	3.11	3.02	3.37	3.31	3.05

		Age				Gender		Education	
Attitude towards science and technology	Total	18-34	35-44	45-64	65+	Male	Female	Non-University degree	University degree
<i>AX10_ In favour or against the development of the science and technology (Mean, scale 1-5)</i>	4.44	4.40	4.49	4.46	4.31	4.52	4.36	4.32	4.62
<i>AX9_ In favour or against the following statement: The scientific and technologic development has too many unpredictable negative effects in the human health and the environment (Mean, scale 1-5)</i>	2.84	2.90	2.79	2.86	2.79	2.69	2.98	2.98	2.63

		Age				Gender		Education	
Attitude towards nuclear energy	Total	18-34	35-44	45-64	65+	Male	Female	Non-University degree	University degree
<i>RT2_ Opinion about the use of nuclear energy to produce electricity (Mean, scale 1-5)</i>	2.72	2.61	2.75	2.71	2.91	2.84	2.61	2.69	2.76

		Age				Gender		Education	
Trust in the management of nuclear technology	Total	18-34	35-44	45-64	65+	Male	Female	Non-University degree	University degree
<i>MN1_ Nuclear reactors are safely operated in Spain (Mean, scale 1-5)</i>	3.10	3.11	3.14	3.05	3.10	3.22	2.98	3.04	3.18
<i>MN2_ Insufficient control by the authorities in relation with the safety in the Spanish nuclear facilities (Mean, scale 1-5)</i>	3.13	3.12	3.09	3.14	3.24	3.03	3.22	3.18	3.07
<i>MN6_ I feel protected from the risks of nuclear installations (Mean, scale 1-5)</i>	2.68	2.70	2.65	2.65	2.81	2.83	2.54	2.64	2.74

		Age				Gender		Education	
Behaviour in emergency situations	Total	18-34	35-44	45-64	65+	Male	Female	Non-University degree	University degree
<i>SE1_ The authorities have advised the population of the towns closest to the NPP to shelter in place, but there are not necessary actions in your area. What will you do? (%)</i>									
<i>Nothing special, I would do normal life</i>	16.3	17.5	12.3	18.5	16.9	16.7	16.0	16.1	16.7
<i>Shelter in place</i>	39.9	41.0	40.5	38.0	41.6	38.7	40.9	38.2	42.3
<i>Abandon the zone (go to another farthest place)</i>	36.0	34.9	36.8	36.6	34.8	37.4	34.7	38.0	33.0
<i>SE2_ But if the authorities have advised the population of the towns closest to the NPP to evacuate, but in your area, you have to shelter in place. What will you do? (%)</i>									
<i>Nothing special, I would do normal life</i>	4.0	1.9	4.8	4.9	7.1	6.5	2.2	3.4	4.9
<i>Shelter in place</i>	44.0	43.7	49.0	39.5	35.7	37.1	48.9	42.5	46.3
<i>Abandon the zone (go to another farthest place)</i>	47.7	48.5	41.3	54.3	50.0	55.6	42.1	49.2	45.5
<i>In case of nuclear accident, if advised, would you...?</i>									
<i>EM1_ Shelter in place (Mean, scale 1-6)</i>	3.97	4.09	4.26	3.83	3.44	3.72	4.21	3.92	4.05
<i>EM2_ Avoid the use of the phone (mobile and landline) (Mean, scale 1-6)</i>	3.46	3.61	3.76	3.31	2.83	3.14	3.76	3.44	3.50
<i>EM3_ Leave the children at school (Mean, scale 1-6)</i>	2.23	2.05	2.21	2.40	1.00	2.21	2.24	2.09	2.44
<i>EM4_ Take a iodine tablet (Mean, scale 1-6)</i>	3.96	3.91	4.33	3.95	3.14	4.04	3.88	3.82	4.16
<i>EM6_ Not consuming local food (Mean, scale 1-6)</i>	4.30	4.42	4.63	4.15	3.60	4.15	4.43	4.11	4.57
<i>EM7_ Abandon the zone for some days (Mean, scale 1-6)</i>	4.64	4.79	4.89	4.41	4.35	4.56	4.72	4.56	4.75
<i>EM8_ Not drinking water from the tap (Mean, scale 1-6)</i>	4.79	5.03	5.04	4.58	4.25	4.68	4.89	4.58	5.09
<i>To what extent do you think the people in your neighbourhood would obey these official recommendations?</i>									
<i>EM9_ To shelter in place (Mean, scale 1-6)</i>	3.68	3.65	3.71	3.73	3.51	3.46	3.89	3.64	3.74
<i>EM10_ Avoid the use of the phone (mobile and landline) (Mean, scale 1-6)</i>	2.91	2.79	2.94	2.97	2.95	2.60	3.20	3.02	2.76
<i>EM11_ Leave the children</i>	2.52	2.62	2.58	2.46	2.36	2.48	2.57	2.52	2.53

<i>at school (Mean, scale 1-6)</i>									
<i>EM12_ Take a iodine tablet (Mean, scale 1-6)</i>	3.81	3.66	3.96	3.85	3.67	3.82	3.80	3.77	3.87
<i>EM14_ Not consuming local food (Mean, scale 1-6)</i>	3.98	4.14	4.19	3.76	3.76	3.89	4.05	3.88	4.12
<i>EM15_ Abandon the zone for some days (Mean, scale 1-6)</i>	4.31	4.35	4.35	4.27	4.24	4.34	4.28	4.30	4.33
<i>EM16_ Not drinking water from the tap (Mean, scale 1-6)</i>	4.35	4.47	4.42	4.26	4.16	4.26	4.44	4.23	4.52
<i>How easy or difficult do you think it would be for you and your family to take the following actions in the event of a nuclear emergency?</i>									
<i>SE3_ To shelter in place for an entire day (Mean, scale 1-5)</i>	3.63	3.56	3.71	3.65	3.48	3.47	3.77	3.60	3.67
<i>SE4_ Avoid the use of the phone (mobile and landline) (Mean, scale 1-5)</i>	3.01	2.82	3.02	3.14	3.03	2.92	3.10	3.01	3.02
<i>SE5_ Leave the children at school (Mean, scale 1-5)</i>	2.13	2.24	2.11	2.11	1.00	2.26	2.02	1.98	2.38
<i>SE6_ Find and take a iodine tablet (Mean, scale 1-5)</i>	2.78	2.65	2.89	2.82	2.77	2.92	2.69	2.80	2.76
<i>SE7_ Not consuming local food (Mean, scale 1-5)</i>	3.76	3.79	3.77	3.79	3.59	3.65	3.87	3.73	3.81
<i>SE8_ Abandon the zone for some days, through an organized evacuation (Mean, scale 1-5)</i>	3.63	3.47	3.80	3.56	3.81	3.68	3.58	3.57	3.72
<i>SE9_ Not drinking water from the tap (Mean, scale 1-5)</i>	4.09	4.16	4.08	4.08	3.96	4.00	4.17	4.11	4.06
<i>And to what extent do you think the following recommended actions would protect you from the harmful effects on the health of a radioactive leak in air?</i>									
<i>SE10_ To shelter in place (Mean, scale 1-5)</i>	2.70	2.74	2.66	2.64	2.88	2.59	2.80	2.72	2.67
<i>SE11_ Take iodine tablets to protect oneself of the negative effects of radioactive iodine. (Mean, scale 1-5)</i>	3.02	3.06	3.01	3.00	3.03	3.03	3.01	3.00	3.06
<i>SE12_ Abandon the zone, through an organized evacuation (Mean, scale 1-5)</i>	4.00	4.03	4.01	3.97	4.02	4.06	3.95	3.96	4.07
<i>SE13_ Not consuming local food (Mean, scale 1-5)</i>	3.87	3.83	3.93	3.83	3.89	3.80	3.93	3.81	3.94

5)									
<i>SE14_ Not drinking water from the tap (Mean, scale 1-5)</i>	3.99	4.00	4.02	3.97	3.98	3.97	4.02	3.94	4.07

		Age				Gender		Education	
Iodine tablets	Total	18-34	35-44	45-64	65+	Male	Female	Non-University degree	University degree
<i>K11b_ Do you know about the existence of iodine tablets? (% yes)</i>	27.6	24.5	28.6	30.0	24.7	34.6	21.1	25.0	31.5
<i>K13_ Would you like to have these iodine tablets in your home, even if you do not live in the distribution area? (% yes)</i>	60.7	63.3	65.5	58.3	56.0	62.4	58.8	56.7	66.7

		Age				Gender		Education	
Perception of information	Total	18-34	35-44	45-64	65+	Male	Female	Non-University degree	University degree
<i>E11_ I feel well informed about what to do in the event of a nuclear accident (Mean, scale 1-5)</i>	1.91	1.91	1.90	1.93	1.89	2.02	1.81	1.92	1.90
<i>E12_ I do not know enough about protective actions to judge whether they are efficient in the event of a nuclear accident (Mean, scale 1-5)</i>	3.77	3.82	3.74	3.81	3.60	3.57	3.95	3.78	3.76
<i>E13_ The authorities should make more efforts to inform the population about protection actions in the event of a nuclear accident (Mean, scale 1-5)</i>	4.19	4.07	4.18	4.28	4.20	4.10	4.27	4.22	4.14
<i>E14_ I know where to find information on protective actions in the event of a nuclear accident (Mean, scale 1-5)</i>	2.38	2.34	2.42	2.48	2.09	2.46	2.31	2.35	2.43
<i>E15_ I trust that in case of nuclear accident I would find the necessary information to protect myself (Mean, scale 1-5)</i>	2.96	2.87	2.95	3.02	2.98	3.02	2.90	2.92	3.02

		Age				Gender		Education	
Trust in information sources	Total	18-34	35-44	45-64	65+	Male	Female	Non-University degree	University degree
<i>To what extent do you trust the following actors to transmit correct and objective information about personal protection measures in the event of a nuclear accident?</i>									
<i>EMA1_Environmental NGOs (Mean, scale 1-6)</i>	4.23	4.04	4.30	4.08	4.30	4.18	4.29	4.20	4.28
<i>EMA2_Media (Mean, scale 1-6)</i>	3.78	3.51	3.67	3.94	3.84	3.85	3.71	3.83	3.71
<i>EMA3_Consejo de Seguridad Nuclear (CSN) (Mean, scale 1-6)</i>	4.31	4.38	4.31	4.34	4.18	4.33	4.28	4.26	4.38
<i>EMA4_Doctors (Mean, scale 1-6)</i>	4.84	4.71	4.91	4.86	4.83	4.88	4.85	4.80	4.96
<i>EMA5_Emergency Services (Mean, scale 1-6)</i>	4.95	4.81	5.02	5.02	4.88	4.99	4.98	4.92	5.08
<i>EMA5b_Civil Protection (Mean, scale 1-6)</i>	4.67	4.29	4.66	4.79	4.82	4.70	4.73	4.67	6.78
<i>EMA6_Centro de Investigaciones Energéticas, Medio Ambientales y Tecnológicas (CIEMAT) (Mean, scale 1-6)</i>	4.54	4.43	4.68	4.57	4.40	4.55	4.61	4.46	4.75
<i>EMA7_University scientists (Mean, scale 1-6)</i>	4.68	4.40	4.88	4.75	4.61	4.71	4.62	4.57	4.79
<i>EMA8_Red Cross (Mean, scale 1-6)</i>	4.66	4.36	4.63	4.69	4.95	4.73	4.58	4.63	4.69
<i>EMA9_Comité Estatal de Coordinación del Riesgo Radiológico (CECO) (Mean, scale 1-6)</i>	4.53	4.45	4.69	4.52	4.41	4.47	4.55	4.44	4.61
<i>EMA10_Local and Regional Authorities (Mean, scale 1-6)</i>	3.52	3.33	3.52	3.59	3.58	3.58	3.61	3.59	3.61
<i>EMA11_Parliamentarians (Mean, scale 1-6)</i>	2.65	2.90	2.51	2.59	2.68	2.72	2.71	2.72	2.72
<i>EMA11b_Ministry (Mean, scale 1-6)</i>	3.04	3.06	2.74	3.10	3.27	3.12	3.01	3.12	2.97

		Age				Gender		Education	
Knowledge	Total	18-34	35-44	45-64	65+	Male	Female	Non-University degree	University degree
<i>AW1_Does exposure to radiation always lead to</i>	57.4	54.2	55.9	57.7	68.3	50.3	65.1	66.5	45.0

<i>radioactive contamination? (% yes)</i>									
<i>AW15_Vegetables growing near a nuclear power plant are not good for consumption due to radioactivity (% agree)</i>	58.7	57.6	53.7	58.9	73.2	51.2	65.8	61.8	54.3
<i>AW16_Even low levels of radiation due to an accident are dangerous to human health (% agree)</i>	83.1	82.9	79.6	86.7	78.8	79.8	86.1	85.1	80.2
<i>AW17_Natural radioactivity is never dangerous (% agree)</i>	19.3	17.0	16.6	20.5	28.8	19.3	19.4	22.6	14.6
<i>AW18_The human body contains natural radiation (% agree)</i>	79.7	79.3	83.7	76.8	80.0	84.9	73.2	76.1	84.5
<i>AW19_Over time, radioactive substances become more radioactive (% agree)</i>	32.0	36.7	30.6	29.1	31.6	23.1	43.6	38.5	23.6
<i>AW20_The sterilization of the food by irradiation converts the food into radioactive (% agree)</i>	22.7	31.4	17.9	20.5	21.9	17.4	30.6	25.8	18.6

		Age				Gender		Education	
Experience	Total	18-34	35-44	45-64	65+	Male	Female	Non-University degree	University degree
<i>AW21_ Have you ever visited a nuclear power plant? (% yes)</i>	28.4	32.4	24.8	29.5	24.1	32.3	24.7	27.8	29.1
<i>AW26_ Have you ever had a job that involved the use of radioactivity? (% yes)</i>	11.3	8.9	11.4	12.8	11.6	13.5	9.2	10.8	11.9
<i>AW27_ Have you ever had a family member or close friend with a job that involved the use of radioactivity? (% yes)</i>	33.0	33.8	39.6	28.8	28.2	34.9	31.2	31.6	35.0
<i>AW28_ Have you ever had a radiodiagnosis test? (% yes)</i>	68.3	56.6	76.3	71.8	64.7	63.7	72.6	65.7	72.3
<i>AW29_ Have you ever received chemotherapy sessions? (% yes)</i>	3.9	3.4	2.8	4.6	5.7	3.9	3.9	4.7	2.8

Annex II. Questionnaire (in Spanish)

1. Variables Sociodemográficas

S2	Sexo	1. Hombre 2. Mujer
S3	Lugar de residencia	 [código postal]
S10	¿Cuántos años lleva residiendo en su población actual de residencia?	 [Años]
S4	Año de nacimiento	 [año]
S5	¿Cuál es la titulación máxima que ha obtenido?	1. Educación primaria o sin estudios 2. Educación Secundaria Obligatoria (ESO) 3. Bachillerato 4. Enseñanzas de grado medio de Formación Profesional 5. Enseñanzas de grado superior de Formación Profesional 6. Estudios universitarios
S6	Ocupación actual	1. Autónomo 2. Empleado 3. Ama/o de casa 4. Jubilado 5. Sin empleo 6. Estudiante 7. Otro 9. NS/NC
S7	¿Cuántos miembros de la familia viven actualmente en el hogar (incluyéndole a usted mismo)? Los hijos que viven en residencias de estudiantes y regresan a casa los fines de semana también forman parte del hogar.	
S8	¿Y cuántos de ellos son menores de 12 años?	
S9	¿Consume de forma regular productos de su huerto o cooperativas locales? (leche, verduras o fruta)?	1. No 2. Una vez a la semana 3. Varias veces a la semana 4. Todos los días 9. No sabe / no contesta
S11	Estado civil	

2. Percepción del riesgo

¿Cómo percibe el riesgo potencial para su salud dentro de los próximos 20 años de cada una de las siguientes fuentes de radiación?

ALEATORIZAR

RPP2	Residuos radioactivos	1. Sin riesgo 2. Muy bajo 3. Bajo 4. Moderado 5. Alto 6. Muy alto 9. No sabe / no contesta
RPP3	Teléfonos móviles	
RPP5	Un accidente en una instalación nuclear	
RPP7	Radiación natural (p.ej. radiación del suelo, como radón, o del espacio)	
RPP8	Pruebas médicas con rayos X (radiografías, TAC)	
RPP10	Residuos radioactivos en la comida	
RPP11	Uso de tecnología nuclear por parte de terroristas	

Y, ¿en qué medida se siente preocupado por el riesgo derivado de cada uno de estos elementos?

ALEATORIZAR

RPP2b	Residuos radioactivos	1. Nada preocupado 2. Un poco preocupado 3. Algo preocupado 4. Muy preocupado 5. Extremadamente preocupado 9. No sabe / no contesta
RPP3b	Teléfonos móviles	
RPP5b	Un potencial accidente en una instalación nuclear	
RPP7b	Radiación natural (p.ej. radiación del suelo, como radón, o del espacio)	
RPP8b	Rayos X de uso médico	
RPP10b	Residuos radioactivos en la comida	
RPP11b	Uso de tecnología nuclear por parte de terroristas	

3. Actitud hacia la ciencia y la tecnología

AX10	¿En general, hasta qué punto es usted favorable o está en contra del desarrollo de la ciencia y la tecnología? Está usted...	1. Totalmente en contra 2. Algo en contra 3. Ni a favor ni en contra 4. Algo a favor 5. Totalmente a favor 9. No sabe/no contesta
------	--	--

En qué medida está de acuerdo o en desacuerdo con la siguiente afirmación:

AX 9	El desarrollo científico y tecnológico tiene demasiados efectos negativos imprevisibles en la salud humana y el medioambiente	1. Muy en desacuerdo 2. En desacuerdo 3. Ni acuerdo, ni en desacuerdo 4. De acuerdo 5. Muy de acuerdo 9. No sabe / no contesta
------	---	---

4. Actitudes hacia la tecnología nuclear

RT2	¿Cuál es su opinión acerca del uso de la energía nuclear para la producción de electricidad? Está usted...	1. Totalmente en contra 2. Algo en contra 3. Ni a favor ni en contra 4. Algo a favor 5. Totalmente a favor 9. No sabe/no contesta
-----	--	--

5. Confianza en la gestión de la tecnología nuclear

Ahora discutiremos sobre la gestión de la tecnología nuclear. ¿Hasta qué punto está de acuerdo o en desacuerdo con las siguientes afirmaciones?

ALEATORIZAR

MN 1	Los reactores nucleares en España son operados de un modo seguro	1. Totalmente en desacuerdo
MN 2	Hay un control insuficiente por parte de las autoridades en relación a la seguridad de las instalaciones nucleares en España.	2. En desacuerdo
MN6	Me siento protegido frente a los riesgos de las instalaciones nucleares	3. Ni de acuerdo, ni en desacuerdo
		4. De acuerdo
		5. Totalmente de acuerdo
		9. No sabe / no contesta

7. Comportamiento en situaciones de emergencia

(Filtro: POBLACIÓN AFECTADA entre 0 y 30 km de la CN)

AW25	¿A qué distancia está su hogar de la instalación nuclear más cercana? (aproximadamente, en km.)	0-10 km 11-30 km 31-50 km 51-100 km Más de 100 km
------	--	---

Las siguientes preguntas están relacionadas con situaciones de emergencia.

Imagine que acaba de escuchar la noticia de que se ha producido **un accidente en la central nuclear más próxima a su residencia** y la radioactividad ha sido liberada en el ambiente.

EC1. ¿Cuál sería su primera preocupación? _____

EC2. ¿Cuál sería su primera reacción? _____

SE1.	Suponga que las autoridades han aconsejado a la población de los pueblos o municipios más cercanos a la central que deben permanecer confinados en el interior de casa o de un edificio, pero no son necesarias acciones en su área. ¿Qué haría usted?	1. Nada especial, haría vida normal 2. Permanecer confinado en el interior 3. Abandonar la zona (ir a otro lugar más lejano) 4. Otra cosa: ABIERTA 9. No sabe / no contesta
SE2.	Y si las autoridades han aconsejado a la población de los pueblos o municipios más cercanos que deben abandonar la zona (evacuar), pero la población en su zona debe permanecer confinada en el interior de casa o de un edificio. ¿Qué haría usted?	

A continuación, se muestran una serie de acciones que las autoridades podrían aconsejar llevar a cabo en caso de accidente nuclear. ¿**Seguiría estas acciones** si fuera aconsejado a hacerlo?:

EM1.	Permanecer en el interior de casa o de un edificio	1. Definitivamente no 2. Probablemente no 3. Quizás no 4. Quizás si 5. Probablemente si 6. Definitivamente si 9. No sabe/No contesta
EM2.	Evitar el uso del teléfono (fijo y móvil)	
EM3.	FILTRO: con hijos Dejar a los hijos en la escuela	
EM4	Tomar una pastilla de yodo	
EM6	No consumir alimentos locales	

EM7.	Abandonar la zona afectada por unos días	
EM8	No beber agua del grifo	

¿En qué medida cree que **la gente de su vecindario obedecería** estas recomendaciones oficiales?

EM9.	Permanecer en el interior de casa o de un edificio	1. Definitivamente no 2. Probablemente no 3. Quizás no 4. Quizás si 5. Probablemente si 6. Definitivamente si 9. No sabe/No contesta
EM10.	Evitar el uso del teléfono (fijo y móvil)	
EM11.	FILTRO: con hijos Dejar a los hijos en la escuela	
EM12.	Tomar una pastilla de yodo	
EM14.	No consumir alimentos locales	
EM15.	Abandonar la zona afectada por unos días	
EM16.	No beber agua del grifo	

¿Cómo de **fácil o difícil cree que sería** para usted y su familia realizar las siguientes acciones en caso de una emergencia nuclear?

SE3.	Permanecer sin salir de casa o de un edificio un día entero	1. Muy difícil o casi imposible 2. Difícil 3. Ni difícil ni fácil 4. Fácil 5. Muy fácil 9. No sabe/No contesta
SE4.	Evitar el uso del teléfono (fijo y móvil)	
SE5.	FILTRO: con hijos Dejar a los hijos en la escuela	
SE6.	Encontrar y tomar una pastilla de yodo	
SE7.	No consumir alimentos locales	
SE8.	Abandonar el hogar por unos días, a través de una evacuación organizada	
SE9.	No beber agua del grifo	

--	--	--

¿Y hasta qué punto cree que las siguientes acciones recomendadas **le protegerían** de los efectos perjudiciales en la salud de una fuga radioactiva en el aire?:

SE10.	Permanecer en el interior de casa o de un edificio	1. Nada 2. No mucho 3. Moderadamente 4. Bastante 5. Completamente 9. No sabe/No contesta
SE11.	Tomar pastillas de yodo para protegerse uno mismo de los efectos negativos del yodo radioactivo	
SE12.	Abandonar la zona, a través de una evacuación organizada	
SE13.	No consumir alimentos locales	
SE14.	No beber agua del grifo	

(Filtro: POBLACIÓN GENERAL a partir de 30 km de la CN)

AW25	¿A qué distancia está su hogar de la instalación nuclear más cercana? (aproximadamente, en km)	0-10 km 11-30 km 31-50 km 51-100 km Más de 100 km
------	---	---

Las siguientes preguntas están relacionadas con situaciones de emergencia.

Imagine que acaba de escuchar la noticia de que se ha producido **un accidente en la central nuclear más próxima a su residencia** y la radioactividad ha sido liberada en el ambiente.

EC1. ¿Cuál sería su primera preocupación? _____

EC2. ¿Cuál sería su primera reacción? _____

SE1.	Suponga que las autoridades han aconsejado a la población de los pueblos o municipios más cercanos a la central que deben permanecer confinados en el interior de casa o un edificio, pero no son necesarias acciones en su área. ¿Qué haría usted?	1. Nada especial, haría vida normal 2. Permanecer confinado en el interior 3. Abandonar la zona (ir a otro lugar más lejano) 4. Otra cosa: ABIERTA 9. No sabe / no contesta
------	--	---

A continuación, se muestran una serie de acciones que las autoridades podrían aconsejar llevar a cabo en caso de accidente nuclear a la población más cercana a la central (menos de 30km).
¿Aunque usted no viva en esta zona, **realizaría alguna de estas acciones?**:

EM1.	Permanecer en el interior de casa o un edificio	1. Definitivamente no 2. Probablemente no 3. Tal vez no 4. Tal vez sí 5. Probablemente sí 6. Definitivamente sí 9. No sabe / No contesta
EM2.	Evitar el uso del teléfono (fijo y móvil)	
EM3.	FILTRO: con hijos Dejar a los hijos en la escuela	
EM4.	Tomar una pastilla de yodo	
EM6.	No consumir alimentos locales	
EM7.	Abandonar la zona por unos días	
EM8.	No beber agua del grifo	

¿En qué medida cree que **la gente de su vecindario llevaría a cabo estas acciones?**

EM9.	Permanecer en el interior de casa o de un edificio	1. Definitivamente no 2. Probablemente no 3. Tal vez no 4. Tal vez sí 5. Probablemente sí 6. Definitivamente sí 9. No sabe / No contesta
EM10.	Evitar el uso del teléfono (fijo y móvil)	
EM11.	FILTRO: con hijos Dejar a los hijos en la escuela	
EM12.	Tomar una pastilla de yodo	
EM14.	No consumir alimentos locales	
EM15.	Abandonar la zona por unos días	
EM16.	No beber agua del grifo	

¿Cómo de **fácil o difícil** cree que **sería** para usted y su familia realizar las siguientes acciones en caso de una emergencia nuclear?

SE3.	Permanecer sin salir de casa o de un edificio un día entero	1. Muy difícil o casi imposible 2. Difícil 3. Ni difícil ni fácil 4. Fácil
------	---	---

		5. Muy fácil 9. No sabe / No contesta
SE4.	Evitar el uso del teléfono (fijo y móvil)	
SE5.	FILTRO: con hijos Dejar a los hijos en la escuela	
SE7.	No consumir alimentos locales	
SE8.	Abandonar el hogar por unos días	
SE9.	No beber agua del grifo	

¿Y hasta qué punto cree que las siguientes acciones **le protegerían** de los efectos perjudiciales en la salud de una fuga radioactiva en el aire?:

SE10.	Permanecer en el interior de casa o de un edificio	1. Nada 2. No mucho 3. Moderadamente 4. Bastante 5. Completamente 9. No sabe/No contesta
SE11.	Tomar pastillas de yodo para protegerse uno mismo de los efectos negativos del yodo radioactivo	
SE12.	Abandonar la zona	
SE13.	No consumir alimentos locales	
SE14.	No beber agua del grifo	

Pastillas de yodo

En España está prevista la distribución de pastillas de yodo a la población en caso de accidente nuclear, de acuerdo a lo establecido en los Planes de Emergencia de las zonas donde están situadas las centrales nucleares.

KI1b	¿Conoce la existencia de las pastillas de yodo?	1. Si 2. No 9. No sabe/No contesta
KI3.	FILTRO: A partir de 30 km Le gustaría tener estas pastillas de yodo en su domicilio, aunque no viva en el área de distribución	1. Si 2. No 9.No sabe/No contesta
KI4.	FILTRO: Hasta 30 km ¿Conoce usted donde conseguir una de esas pastillas de yodo?	1. En la farmacia local 2. En los centros especiales cerca de las instalaciones nucleares 3. En el médico de cabecera 4. En el ayuntamiento

		9. No sabe/no contesta
KI5.	FILTRO: Hasta 30 km ¿Sabe si estas pastillas de yodo son gratuitas o hay que pagarlas?	1. Gratuitas 2. Hay que pagarlas 9. No sabe/no contesta
KI6.	En su opinión, en caso de un accidente nuclear, una pastilla de yodo estable le protegería contra...	Múltiples respuestas posibles 1. Cáncer de pulmón 2. Leucemia 3. Cáncer de tiroides 4. Cualquier efecto derivado de la radiación ionizante 5. Alguna otra cosa 9. No sabe/No contesta
KI8.	¿Cuándo deben tomarse las pastillas de yodo?	1. Inmediatamente: tan pronto sepa que ha habido un accidente o cuando escuche las sirenas 2. Cuando las autoridades lo recomienden oficialmente 3. Dos horas después de la alarma 4. Otra ABIERTA 9. No sabe/No contesta

Percepción de la información / Necesidades de información

¿Hasta qué punto está de acuerdo o en desacuerdo con las siguientes afirmaciones relativas a las acciones de protección en caso de accidente nuclear?

EI1.	Me siento bien informado sobre qué hacer en caso de accidente nuclear	1. Totalmente en desacuerdo 2. En desacuerdo 3. Ni acuerdo, ni en desacuerdo 4. De acuerdo 5. Totalmente de acuerdo 9. No sabe/no contesta
EI2.	No sé lo suficiente sobre las acciones de protección para juzgar si son eficientes en caso de accidente nuclear	
EI3.	Las autoridades deberían esforzarse más en informar a la población sobre acciones de protección en caso de accidente nuclear	
EI4.	Sé dónde encontrar información sobre las acciones de protección en caso de un accidente nuclear	
EI5.	Confío que en caso de accidente nuclear encontraría la información necesaria para protegerme	

Confianza en las fuentes de información

¿En qué medida confía en que los siguientes actores transmitan información correcta y objetiva sobre las medidas de protección personal en caso de accidente nuclear?

EMA1.	Organizaciones medioambientales como Greenpeace, Ecologistas en Acción...	1. No confío en absoluto 2. Confío muy poco 3. Confío poco 4. Confío algo 5. Confío bastante 6. Confío totalmente 9. No sabe / No contesta 10. No conozco a este actor
EMA2.	Los medios de comunicación	
EMA3.	El Consejo de Seguridad Nuclear (CSN)	
EMA4.	Los médicos	
EMA5.	Servicios de Emergencia (Bomberos, Policía)	

EMA5b.	Protección civil	
EMA6.	Centro de Investigaciones Energéticas, Medio Ambientales y Tecnológicas (CIEMAT)	
EMA7.	Los científicos de universidades expertos en el tema	
EMA8.	La Cruz Roja	
EMA9.	Comité Estatal de Coordinación del Riesgo Radiológico (CECO)	
EMA10.	Autoridades Locales y autonómicas (Alcaldes, presidentes de comunidades autónomas)	
EMA11.	Parlamentarios	
EMA11b.	Los ministerios implicados (Interior, Defensa, Sanidad,...)	

12. Conocimientos en el campo nuclear y percepción de los riesgos de la radiación

Las siguientes preguntas conciernen a la tecnología nuclear en general.

¿Qué piensa sobre la siguiente cuestión?

AW1.	¿La exposición a la radiación siempre conlleva contaminación radiactiva?	1. Sí 2. No 9.No sabe/no contesta
------	--	---

¿Hasta qué punto está de acuerdo o en desacuerdo con las siguientes afirmaciones?

AW15	Las verduras que crecen cerca de una central nuclear no son buenas para el consumo debido a la radioactividad.	1. Totalmente en desacuerdo 2. En desacuerdo 3. Ni acuerdo, ni en desacuerdo 4. De acuerdo 5. Totalmente de acuerdo 9. No sabe/no contesta
AW16	Incluso niveles bajos de radiación debido a un accidente son peligrosos para la salud humana	

¿Está de acuerdo o en desacuerdo con las siguientes afirmaciones?

AW17	La radioactividad natural nunca es peligrosa.	1. De acuerdo 2. En desacuerdo 9. No sabe/no contesta
AW18	El cuerpo humano contiene radiación natural.	
AW19	Con el tiempo las sustancias radiactivas se vuelven más radioactivas.	
AW20	La esterilización de la comida por irradiación convierte la comida en radioactiva.	

13. Experiencia "nuclear"

AW21	Ha visitado alguna vez una central nuclear?	1. Sí 2. No 9. No sabe/no contesta
AW26	Ha tenido usted alguna vez un trabajo que haya involucrado el uso de radioactividad (central nuclear, industria u hospital utilizando fuentes radioactivas, radioactividad natural en minerales y otros materiales...)	
AW27	¿Ha tenido alguna vez a un familiar o un amigo cercano con un trabajo que involucrara el uso de radioactividad?	
AW28.	¿Le han hecho alguna vez una prueba de radiodiagnóstico?	
AW29.	¿Ha recibido alguna vez sesiones de quimioterapia?	

