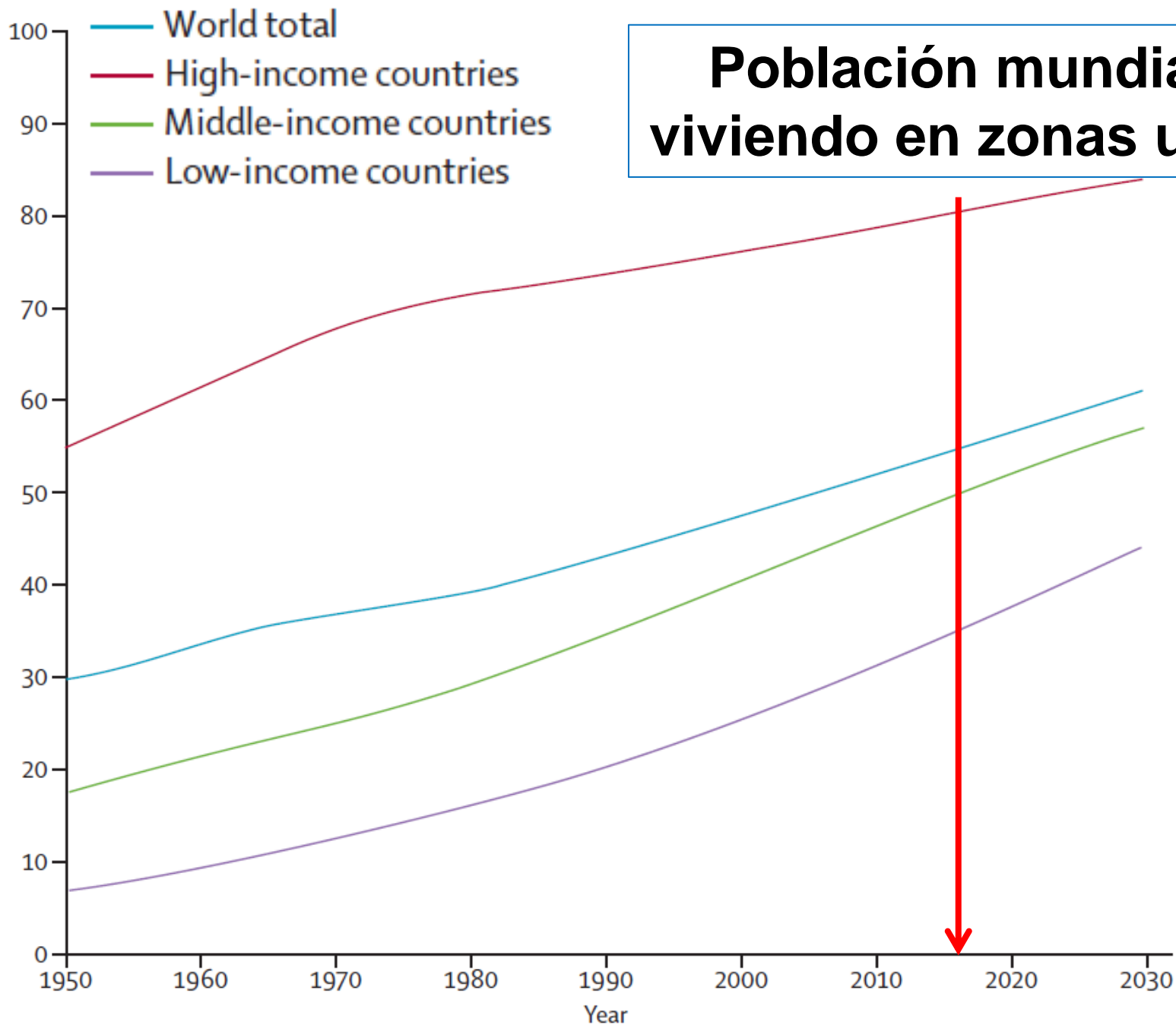


Living in cities and risk of cancer: the multicase-control study in Spain (MCC-Spain)

Cristina Villanueva, Grupo 38 CIBERESP
En nombre de MCC-Spain

Jornada Científica CIBERESP 2018
Madrid, 13 Junio

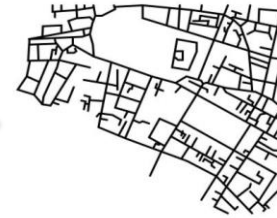
Población mundial (%) viviendo en zonas urbanas



Urban environment



✓ Light at night



✓ Built environment
✓ Physical activity (in-activity)



✓ Air pollution
✓ Noise
✓ High temperatures



✓ Drinking water pollutants



✓ Food environment



✓ Natural environments
(green and blue spaces)

Natural environments and cancer

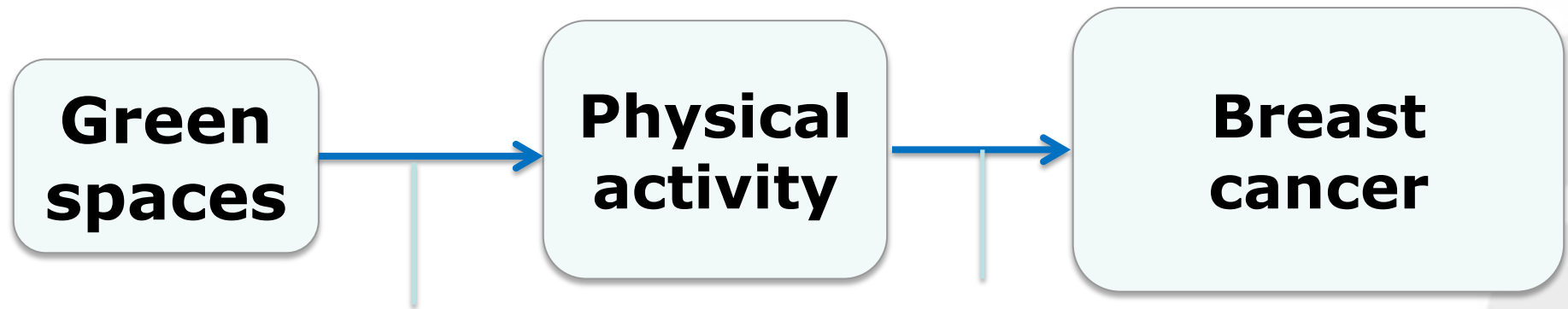


**Green
spaces**



**Breast
cancer**

Natural environments and cancer



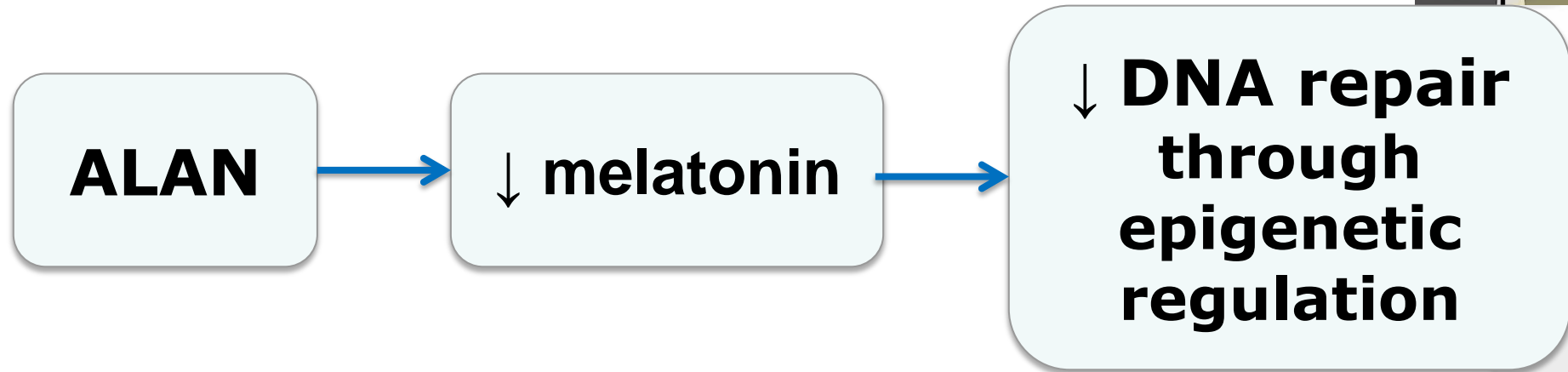
Access to Natural Outdoors
Environments ↑ physical
activity

(Humpel 2002; Kaczynski
2007; McMorris 2014)

↓ breast cancer risk.

prospective cohort (EPIC),
242,918 postmenopausal
women (McKenzie 2015)

Artificial light-at-night (ALAN) and breast cancer



- Higher breast cancer risk reported among night shift workers
- Shift work involving circadian disruption is “probably carcinogenic to humans” (IARC)

OBJECTIVES

To evaluate the association between environmental exposures linked to urbanization and cancer risk using MCC-Spain data



- Acces to green areas and surrounding greenness



- ALAN at night

In relation to prostate and breast cancer

METHODS: The MCC-Study

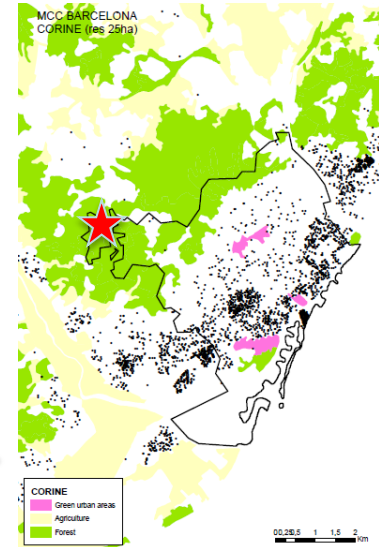
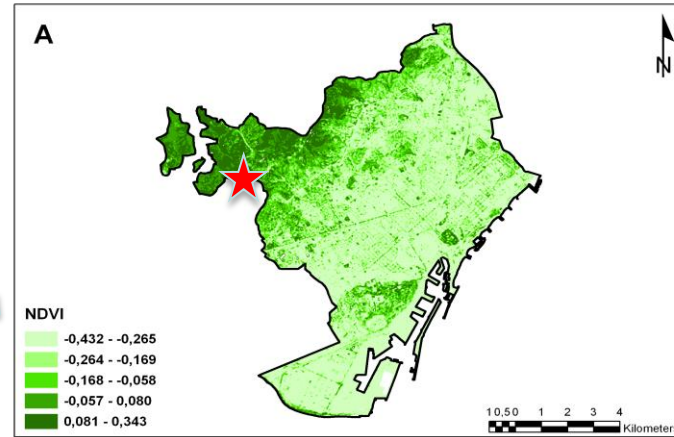
- 10.106 subjects (2008-2013)
- Incident cancer cases:
 - Colon
 - Breast
 - Prostate
 - Stomach
 - Chronic lymphocytic leukemia
- Population controls
- 23 hospitals (12 provinces)
- Age range 20-85 years
- Information on sociodemographic factors, environmental exposures, occupation, medication, lifestyles, personal and family medical **history and detailed residential history**



METHODS: Geocoding and exposure assignment

Access to green areas

Greenness



Light at night



RESULTS. Natural environments



Natural environments and breast cancer



	control	case	Ajusted OR (95%CI)*
Presence of urban green areas within 300m			
No	165	160	Ref.
Yes	977	661	0.65 (0.49-0.86)

* age, socio-economic score at individual level, socio-economic score at area level, education, parity,

Natural environments and breast cancer



	control	case	Ajusted OR (95%CI)*
Presence of urban green areas within 300m			
No	165	160	Ref.
Yes	977	661	0.65 (0.49-0.86)
Presence of agricultural areas within 300m			
No	1308	857	Ref.
Yes	311	272	1.33 (1.07-1.65)
Surrounding greenness (NDVI)			
	2746		1.20 (1.07-1.34)

* age, socio-economic score at individual level, socio-economic score at area level, education, parity,



OR (95%CI)*

Presence of urban green areas within 300m

No	Ref.
Yes	0.65 (0.49-0.86)

Presence of agricultural areas within 300m

No	Ref.
Yes	1.33 (1.07-1.65)

Surrounding greenness (NDVI)

1.20 (1.07-1.34)

* age, socio-economic score at individual level, socio-economic score at area level, education, parity,



OR (95%CI)*		+PM2,5 OR (95%CI)*
Presence of urban green areas within 300m		
No	Ref.	Ref.
Yes	0.65 (0.49-0.86)	0.65 (0.49-0.87)
Presence of agricultural areas within 300m		
No	Ref.	Ref.
Yes	1.33 (1.07-1.65)	1.40 (1.12-1.74)
Surrounding greenness (NDVI)		
<u>1.20 (1.07-1.34)</u>		<u>1.25 (1.11-1.40)</u>

* age, socio-economic score at individual level, socio-economic score at area level, education, parity,

Artificial light-at-night (ALAN)



Indoor ALAN exposure



Indoor ALAN	Controls /Cases	Breast cancer OR (95%CI)	Controls /Cases	Prostate cancer OR (95%CI)
Total darkness	46/49	1.0	94/72	1.0
Almost dark	173/118	0.7 (0.4,1.2)	185/92	0.7 (0.4,1.1)
Dim light	192/178	1.0 (0.6, 1.7)	165/138	1.2 (0.7,1.8)
Quite illuminated	33/31	0.7 (0.4,1.5)	28/54	2.8 (1.5,5.0)

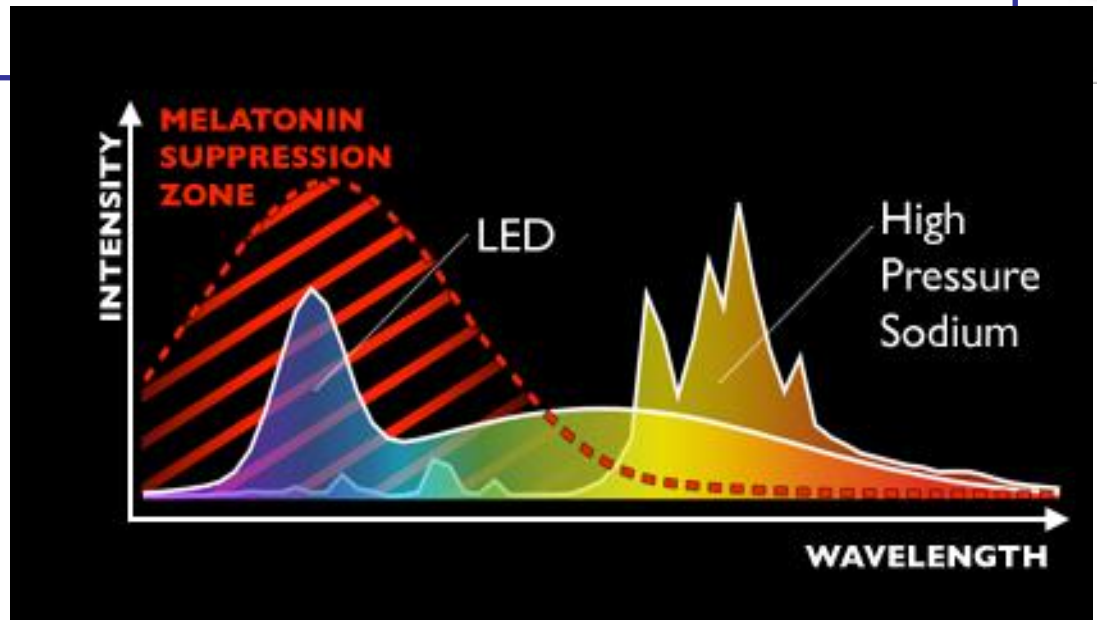
Outdoor ALAN exposure

High vs. low tertile blue light

Breast cancer: OR=1.5 (95%CI 1.0-2.2)

Prostate cancer: OR=2.1 (95%CI 1.4-3.0)

Adjusted for age, centre, educational level, SES score, urban vulnerability index, BMI, smoking, family history of breast/prostate cancer, chronotype, menopausal status (breast cancer) and mutual adjustment for other light exposures.



Conclusions: Green spaces – breast cancer







- Living close to urban green areas protective factor for breast cancer
- Association not mediated by physical activity nor levels of air pollution
- Need to explore other potential mechanisms (stress restoration?)
- Living close to agricultural areas risk factor for breast cancer → Higher exposure to pesticides?

Conclusions: Artificial light at night

- First large study using individual information on the two cancers most strongly associated with circadian disruption and light-at-night.
- Indoor and outdoor ALAN was associated with a higher risk of prostate cancer
- Less consistent findings overall for breast cancer.
- The strongest findings for outdoor blue-light, which is probably the most biologically relevant exposure.

SUMMARY OF RESULTS

Exposure		Breast cancer	Prostate cancer
Green spaces	Urban green areas	↓	
	Agricultural areas	↑	
	Surrounding greenness	↑	
Artificial Light at night	ALAN-outdoor blue light	↑	↑
Water pollution	Disinfection by-products	TTHM 0	
	Nitrate	Chloroform ↑ ↑	
Air pollution	PM _{2.5}		
	NO ₂		

Impact

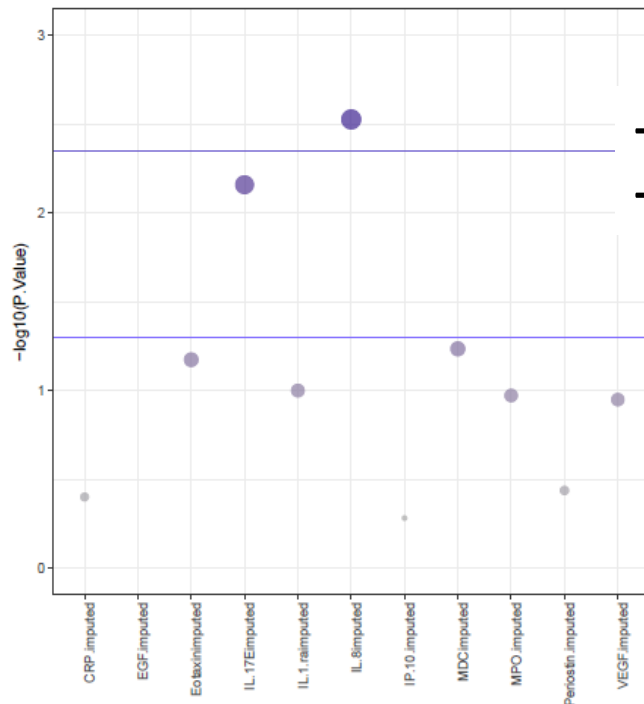
- If these associations are confirmed as causal, interventions on these modifiable risk factors would contribute to reduce cancer burden worldwide



Future...

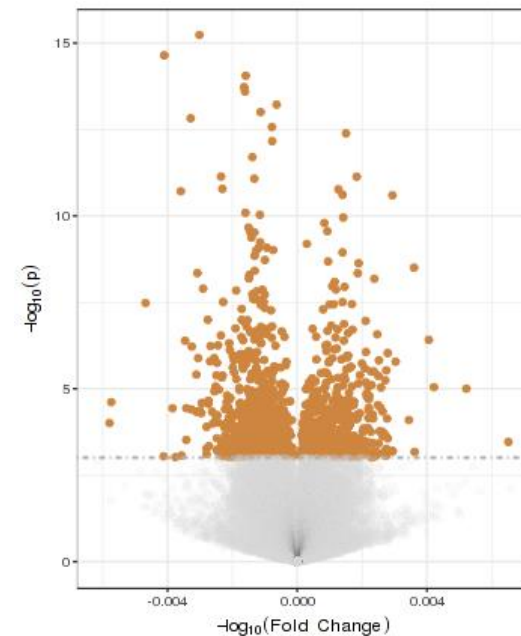
- Inclusion of “-omic” approaches to understand biological mechanisms

Proteomics: Differences in serum immune markers due to long term trihalomethanes (THM) exposure in drinking water



+ Metabolomics
+ Adductomics

Epigenomics: Volcano plots for models of methylation levels comparing subjects with different residential exposure to brominated THMs drinking water



Acknowledgments

ISGlobal, Barcelona:

Cristina O'Callaghan, Ariadna Garcia,
Manolis Kogevinas, Gemma Castaño,
Esther Gracia-Lavedan, Ana Espinosa et al.

Carlos III Institute of Health, Madrid

Marina Pollán, Núria Aragonés, Beatriz Pérez et al

ICO, Barcelona:

Victor Moreno, Silvia de Sanjosé et al

ICO , Girona

Rafael Marcos et al.

Universidad de León

Vicente Martin et al

CARM, Murcia

Carmen Navarro et al

UNICAN, Cantabria

Javier Lorca et al

UGR, Granada

Juan José Jimenez

UNIOVI, Asturias

Adonina Tardón et al

U. Huelva

Juan Alguacil et al

FISABIO:

Rosana Peiró et al

Instituto de Salud Pública de Navarra:

Eva Ardanaz et al

Instituto BioDonistia:

Pilar Amiano et al

Gracias!
