

CLOCS
Digital
Footprints
11th May 2023



Cancer Loyalty Card Study (CLOCS)

is a scientific research project aiming to help reduce delays in ovarian cancer diagnosis using purchase information collected on high street retailers' loyalty cards



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Background



JMIR PUBLIC HEALTH AND SURVEILLANCE

Brewer et al

Original Paper

Association Between Purchase of Over-the-Counter Medications and Ovarian Cancer Diagnosis in the Cancer Loyalty Card Study (CLOCS): Observational Case-Control Study

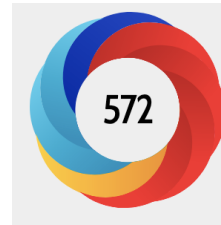
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Early Diagnosis

Published JMIR PHS January 2023

Effectiveness of Animation

Published JMIR August 2022

JMIR PUBLIC HEALTH AND SURVEILLANCE

Hirst et al

Original Paper

Understanding Public Attitudes and Willingness to Share Commercial Data for Health Research: Survey Study in the United Kingdom

Yasemin Hirst^{1,2,3}, BA, MSc, PhD; Sandro T Stoffel^{2,4}, BA, MSc, PhD; Hannah R Brewer³, BSc, MSc, PhD; Lada Timotijevic^{5,6,7}, BSc, PhD; Monique M Raats^{5,6,7}, MSc, PhD; James M Flanagan³, BSc, PhD

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Acceptability

Published JMIR PHS March 2023

Feasibility

In Press BMJ Open

Participant Characteristics

Characteristic		Ovarian Cancer Cases (n = 182)			Controls (n = 427)		
		Mean (SD ¹)	N	%	Mean (SD ¹)	N	%
Age	Mean (SD)	64.7 (10.9)			51.6 (13.7)		
Ethnicity	White		173	95.1		400	93.7
	Non-White		8	4.4		11	2.6
	Prefer not to say		0	0		0	0
	Missing		1	0.5		16	3.7
Loyalty Card	HSR1 card only		48	26.4		169	39.6
	HSR2 card only		44	24.2		116	27.2
	Both HSR1 and HSR2		86	47.3		142	33.3
	Neither		4	2.2		0	0
Household number (incl. participant)²	1		32	22.2		43	14.5
	2		75	52.1		120	40.5
	≥3		29	20.1		131	44.3
	Missing		8	5.6		2	0.7
Eligible for Loyalty Card Data Analysis	Yes		153	84.1		120	28.1
	No**		29	15.9		307	71.9

the Cancer Loyalty Card Study (CLOCS): results from an observational case-control study (submitted)



Transactional Data

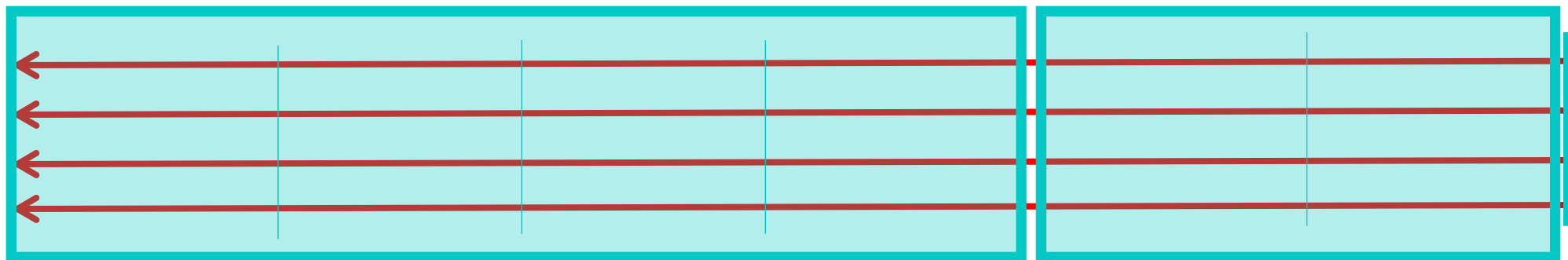
– Retailers keep data up to 6 years with store loyalty card programs

Two High Street Retailers Loyalty Card Data

Participants without OC
Date of Recruitment



Ovarian Cancer Patients
Date of Recruitment / Diagnosis



Results – Ovarian Cancer Risk

• Known risk factors – Not Modifiable

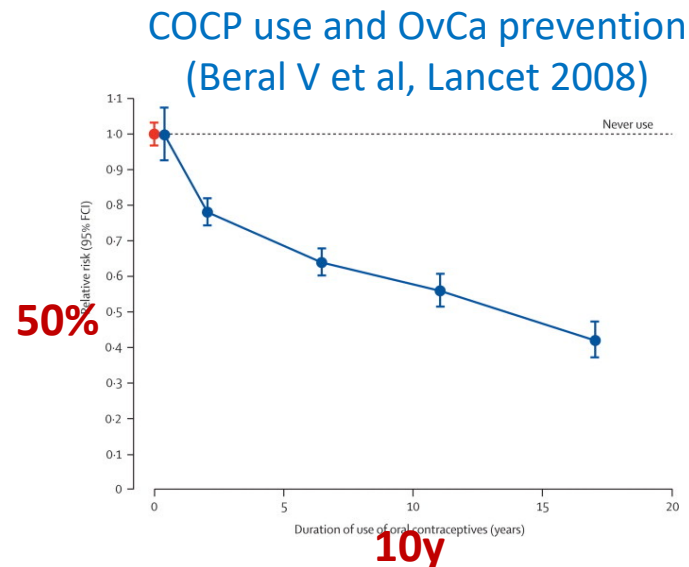
- Age
- Family History
- Genetics (Rare and Common)
 - BRCA1/2 = 40-60% lifetime risk
 - 34 common SNPs
- Hormonal factors – Parity, age at menarche, age at first birth, age at last birth, COCP use
- Inflammation (eg PID);
- Endometriosis

• Prevention can reduce incidence

- Lifestyle changes
- Therapeutic Prevention
 - eg Oral Contraceptive Pills (COCPs)
 - 40-50% reduction in incidence after 10y of use

• Known risk factors – Modifiable

- Diet
- Smoking
- Physical exercise
- Douching
- Hormonal factors - HRT use,



• Histological Subtype Specific

- OC use
 - » Serous OR=0.64 (0.54 to 0.74)
 - » Mucinous OR=1.04 (0.80-1.31)
- Smoking
 - » Mucinous OR = 1.26 (1.08-1.46)
 - » Clear Cell OR = 0.72 (0.55-0.94)
- Endometriosis
 - » Serous OR = 1.03 (0.74-1.46)
 - » Endometrioid OR = 2.32 (1.36-3.95)
 - » Clear Cell OR = 1.62 (0.58-4.51)
 - » Mucinous OR = 2.87 (1.53-5.39)

(Wentzensen et al, 2016)

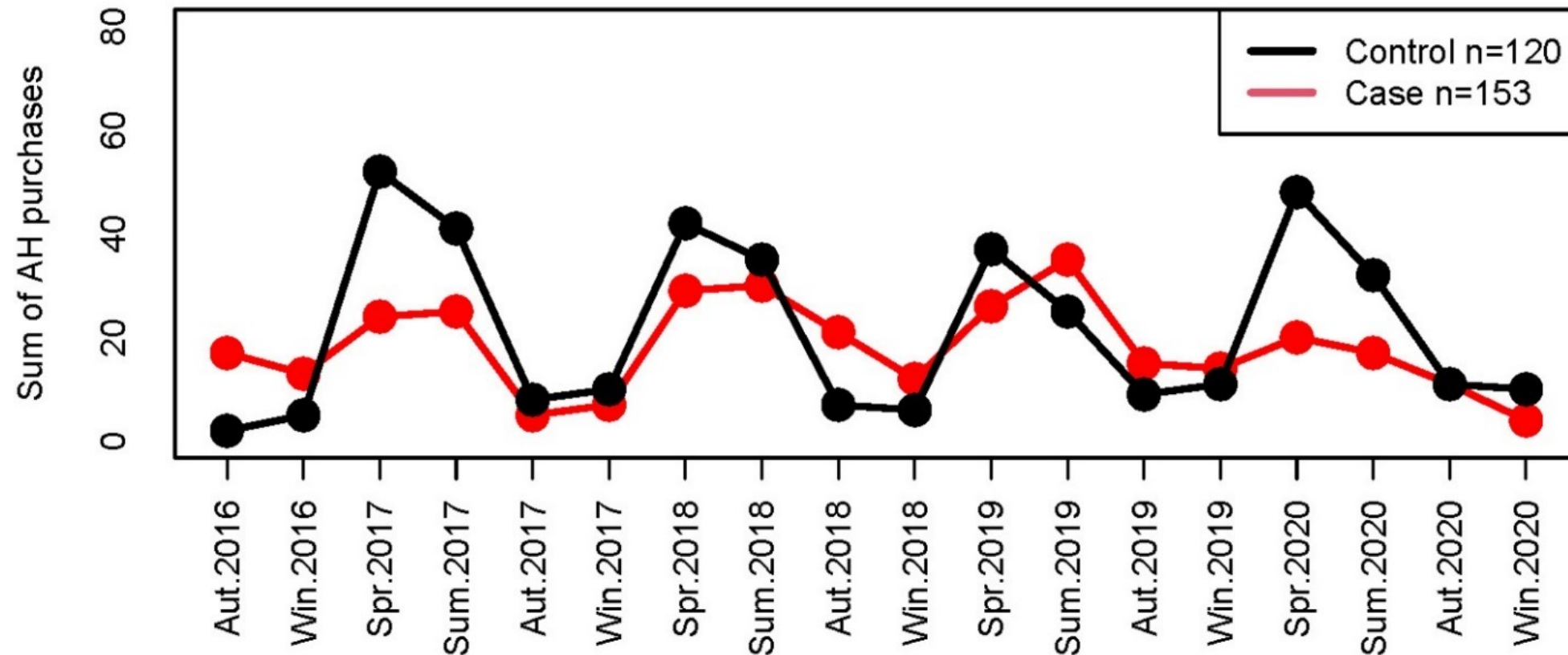
Results – Ovarian Cancer Risk

- Antihistamines appear to be protective against Ovarian cancer
 - Ever vs Never use
 - OR =0.72 (0.57-0.90) only in <50yo women [Verdoodt et al, 2019]
 - OR = 1.02,(0.93–1.11) in >50 yo
 - Mucinous Only (OR = 0.74, 95% CI = 0.57-0.96),

Antihistamine use and risk of ovarian cancer: A population-based case-control study

Freija Verdoodt^{a,*}, Anton Pottegård^b, Christian Dehlendorff^c, Marja Jäätelä^d, Jesper Hallas^b, Søren Friis^{c,e}, Susanne K. Kjaer^{a,f}

Results – Ovarian Cancer Risk



Brewer HR, et al., Seasonal purchase of antihistamines and ovarian cancer risk in the Cancer Loyalty Card Study (CLOCS): results from an observational case-control study (in preparation)

- predominately cetirizine or loratadine tablets and other less common formulations.
- ** case purchases are censored at date of diagnosis

Results – Ovarian Cancer Risk

- Antihistamines appear to be protective against Ovarian cancer
 - OR =0.72 (0.57-0.90) only in <50yo women [Verdoodt et al, 2019]
- In CLOCS we observe protective effect in all ages, but only when bought in spring or summer.
- Overall, OR = 0.68 (0.39-1.19)

Logistic Regression	AH	Control (N)	Case (N)	Adjusted*		
				OR	95% CI	P
All	never	63	104			
	ever	57	49	0.68	0.39,1.19	0.179
Spring	never	74	122			
	ever	46	31	0.52	0.29,0.94	0.031
Summer	never	79	126			
	ever	41	27	0.51	0.28,0.95	0.034
Autumn	never	105	129			
	ever	15	24	1.81	0.83,3.96	0.136
Winter	never	99	132			
	ever	21	21	0.83	0.40,1.71	0.610

Results – Ovarian Cancer Risk

- Antihistamines appear to be protective against Ovarian cancer
 - OR =0.72 (0.57-0.90) only in <50yo women [Verdoodt et al, 2019]
- In CLOCS we observe protective effect in all ages, but only when bought in spring or summer.

Stratified Analyses

Logistic Regression		Control	Case	Adjusted*		
	AH	(N)	(N)	OR	95% CI	P
Seasonal**	never	63	104	ref		
	All year	29	33	0.99	0.51,1.92	0.979
	seasonal	28	15	0.37	0.17,0.82	0.014
Age <50	never	13	21	ref		
	ever	12	12	0.75	0.24,2.32	0.612
Age >=50	never	50	83	ref		
	ever	45	37	0.63	0.33,1.20	0.157
Serous histology	never	63	73	ref		
	ever	57	38	0.90	0.47,1.72	0.747
Non-serous histology	never	63	30	ref		
	ever	57	10	0.41	0.18,0.93	0.033

*adjusted for age and oral contraceptive pill use. Bold represents p<0.05.

** All year represents individuals who purchase in each season, or only in winter or autumn. Seasonal represents individuals who only purchase in spring or summer.

Summary – Conclusions

- **Seasonal purchase** of antihistamines appears associated with reduced risk of ovarian cancer
 - OR = 0.37 (95% CI: 0.17-0.82)
- **Hypothesis:** It is the allergies, rather than the medication that are protective.
- **Histological subtypes** - Like many risk factors, potential for histological subtype specific effects
 - Serous (OR= 0.90 (95% CI: 0.47-1.72))
 - Non-serous (OR = 0.41 (95% CI: 0.18-0.93))
- **Cancer Risk** – Novel opportunity to investigate cancer risk using prospectively collected transactional data.

Summary – limitations

- **Purchase of an item does not equal consumption of the item**
 - Purchasing for others in the household
 - Buy and not eat it / or take the meds even if they are for you
 - (But this limitation applies equally to cases and controls)
- **Not all purchases are captured (buying without card, or in other stores)**
 - Can only address by working with more retailers*
 - (again, applies equally to cases and controls)
- **Participants were recruited during COVID pandemic when shopping habits changed dramatically**
 - Risk – sensitivity analysis pre-pandemic only
 - ED – stratify Dx before and after pandemic, results
- **Lag time for ovarian cancer may be longer than 6 years.**
 - Assume that patterns of purchase over the last 6 years may be a good representation of decades previously

* Other retailers please get in touch

Acknowledgements

CLOCS Team

Hannah Brewer

Yasemin Hirst

Sudha Sundar

Marc Chadeau-Hyam

James Flanagan

Qianhui Jiang

Nour Kanso

Kevin Horeau

Sandeep Kaur

Eric Johnson – Information Governance

NDP Studio – Web Support

SciAni – Animation development

We Rise Online – Social Media

Advertisement

Deb Tanner – Patient Representative

Fiona Murphy – Patient Representative

NHS Recruitment Teams

- Airedale NHS Foundation Trust, Airedale General Hospital
- Brighton and Sussex University Hospitals NHS Trust
- East Lancashire Hospitals NHS Trust, Royal Blackburn Hospital
- East Sussex Healthcare NHS Trust
- Gateshead Health NHS Foundation Trust, Queen Elizabeth Hospital
- Imperial College Healthcare Trust, Hammersmith Hospital
- The Royal Marsden NHS Foundation Trust
- Sandwell and West Birmingham Hospitals NHS Trust, City Hospital
- NHS Greater Glasgow and Clyde, Beatson Cancer Centre
- Cardiff & Vale University LHB, University Hospital of Wales
- Swansea Bay University Health Board



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Allergies and Ovarian Cancer Risk

- Antihistamines appear to be protective against Ovarian cancer
 - OR =0.72 (0.57-0.90) only in <50yo women [Verdoodt et al, 2019]
- In CLOCS we observe protective effect in all ages, but only when bought in spring or summer.
- I.e. Allergies/immune response may be the protective factor for ovarian cancer.

Brewer HR, et al., Seasonal purchase of antihistamines and ovarian cancer risk in the Cancer Loyalty Card Study (CLOCS): results from an observational case-control study **(in preparation)**

CME review

This feature is funded in part by an educational grant from AstraZeneca LP

The association between allergies and cancer: what is currently known?

Ray M. Merrill, PhD, MPH; Ryan T. Isakson, BS; and Robert E. Beck, BS

Direction	Cancer sites	OR (CI)
Increased Risk	Bladder	4.15 (1.61-10.75)
	Prostate	2.49 (1.04-5.93)
Decreased Risk	Glioma	0.59 (0.49-0.71)
	Pancreas	0.77 (0.63-0.95)
No Association	Breast	0.94 (0.51-1.73)
	Lung	1.45 (0.40-5.30) [f]
	Lung	0.64 (0.08-4.87) [m]
Equivocal	Ovarian	0.75 (0.36-1.54)

Results – Allergies and Cancer Risk

Questions:

1. Why some cancers and not others?
2. What part of the allergic reaction prevents ovarian cancer

Hypotheses:

1. Intermittent (seasonal) IgE activation (akin to a regular burst of immunotherapy)
2. Cancer cell surface markers look like pollen with a pre-existing immune memory?

Fig 1. IgE-mediated allergic response

