Le médecin traitant et le recours à la mammographie et au frottis cervico-utérin en Midi Pyrénées

Lisa Ouanhnon

Introduction

- Dispositif du Médecin Traitant (MT)
  - → 96% en 2014[1]
- Rôle de « Gate-keeper »[2]
  - → Organisation/dépenses ville-hôpital
    Qualité de la prise en charge
    Equité des soins
- Premier relais des messages de Santé Publique
  - → Prévention
    - → Cancer du sein
      Cancer du col de l'utérus

1 : ESPS 2014 - enquête santé protection sociale - Avez-vous déclaré un médecin traitant à la Sécurité Sociale ? [IRDES]
2 : Dourgnon P. Les assurés et le médecin traitant : premier bilan après la réforme. 2007

Objectifs

Objectif principal :

- Evaluer l'effet d'avoir un médecin traitant sur le recours aux dépistages des cancers du sein et du col de l'utérus

Objectifs secondaires :

- Explorer les mécanismes mis en jeu → Femmes n'ayant pas de MT ?
- Etudier les disparités territoriales de recours aux dépistages

Matériel et Méthode

Design de l'étude et population

- Données de l'Assurance Maladie (3 principaux régimes)
  - Collectées de manière prospective sur l'année 2012
- Combinées à des données socio-démographiques
  - À partir de l'adresse de résidence

→ 2,574,310 personnes (87 % de la population totale de Midi Pyrénées)

→ 1 072 289 femmes de plus de 16 ans

→ **365,947** femmes de 50 à 74 ans

→ **711,803** femmes de 25 à 65 ans

Outcomes et autres variables

- Outcomes :
  - Au moins 1 mammographie dans l'année
  - Au moins 1 FCU dans l'année

- Variable explicative principale :
  - Avoir un MT déclaré

- Autres variables
  - Âge
  - Etat de santé (ALD)
  - Niveau socio-économique (EDI : European Deprivation Index)
  - Offre de soin :
    - Distance (temps) au cabinet de radiologie le + proche
    - Accessibilité au gynécologue (APL gynéco)
  - Degrés d'urbanisation

Schéma conceptuel

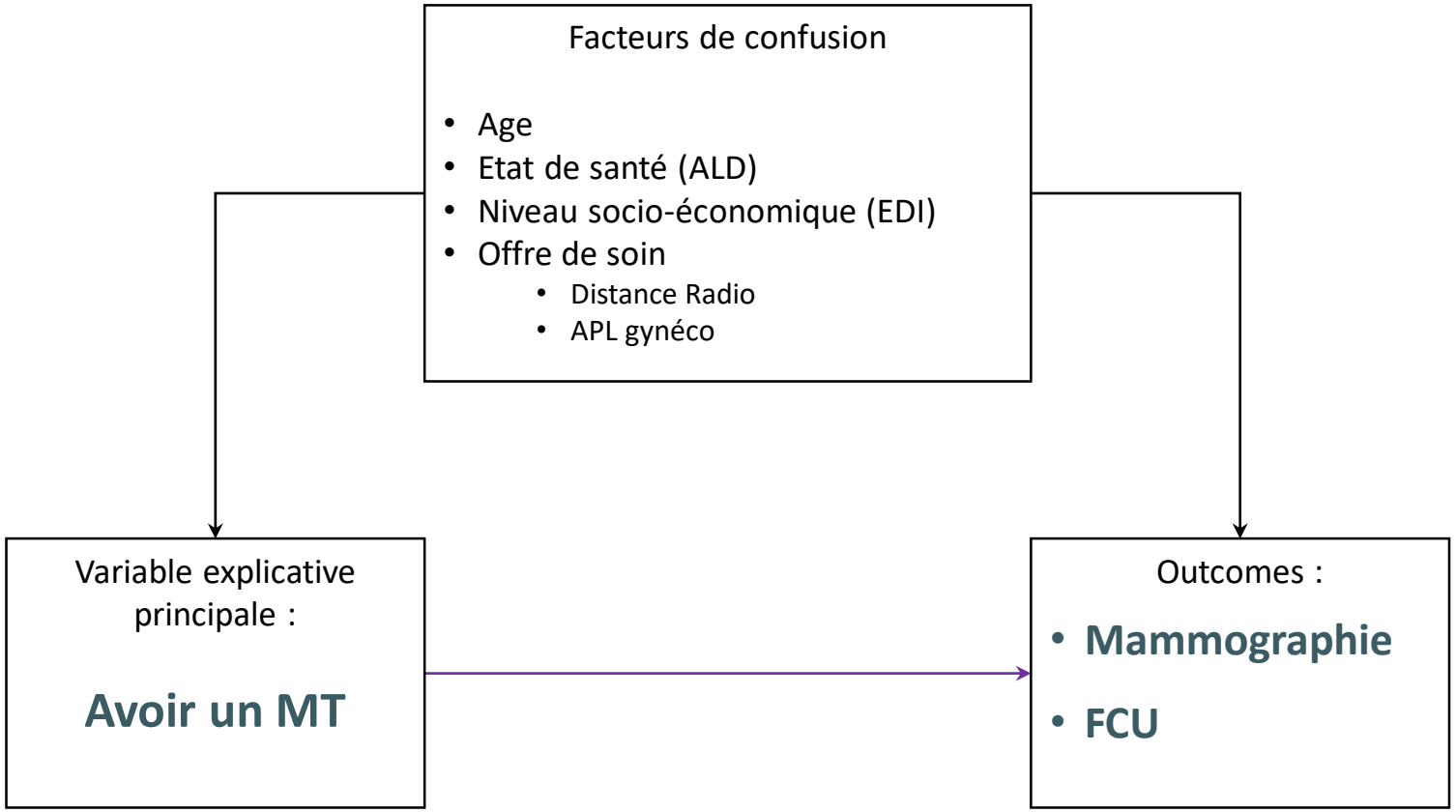

Schéma conceptuel

Facteurs de confusion

- Age
- Etat de santé (ALD)
- Niveau socio-économique (EDI)
- Offre de soin
  - Distance Radio
  - APL gynéco

Degrés d'urbanisation : Toulouse/grand pôle urbain/autre

Variable explicative principale :

Avoir un MT

Outcomes :

- **Mammographie**
- **FCU**

Schéma conceptuel

Facteurs de confusion

- Age
- Etat de santé (ALD)
- Niveau socio-économique (EDI)
- Offre de soin
  - Distance Radio
  - APL gynéco

Degrés d'urbanisation : Toulouse/grand pôle urbain/autre

Variable combinée :

Avoir un MT/
Avoir vu un MG

Outcomes :

- **Mammographie**
- **FCU**

Analyses statistiques

- Analyses descriptives
- Analyses univariées + multivariées (avoir un MT)
- Régression logistique multivariée
  - Ajustement sur les facteurs de confusion
  - Evaluation de l'interaction effet du MT/degrés d'urbanisation

    → Stratification sur le degrés d'urbanisation
  - Analyses exploratoires avec nouvelle variable :

    Avoir un MT/avoir vu un médecin généraliste (MG)
- Logiciel R

Résultats

Analyse descriptive

Variables	Total n= 1 072 289	Toulouse Métropole n= 255 329 (23.81%)	Autres grands pôles urbains n= 445 014 (41.50%)	Autres n= 371 946 (34.69%)
Mammographie dans l'année				
0, n(%)	905277 (84.42)	218420 (85.54)	371933 (83.58)	314924 (84.67)
>=1, n(%)	167012 (15.58)	36909 (14.46)	73081 (16.42)	57022 (15.33)
chez les 50-74 ans, n(%)	*112593 (30.77)*	*22941 (31.46)*	*48092 (31.90)*	*41560 (29.21)*
FCU dans l'année				
0, n(%)	837164 (78.07)	189839 (74.35)	340955 (76.62)	306370 (82.37)
>=1, n(%)	235125 (21.93)	65490 (25.65)	104059 (23.38)	65576 (17.63)
chez les 25-65 ans, n(%)	*205072 (28.81)*	*56992 (31.66)*	*91491 (30.24)*	*56589 (24.69)*
MT déclaré				
Pas de MT déclaré, n(%)	98258 (9.16)	30199 (11.83)	36798 (8.27)	31261 (8.40)
MT déclaré, n(%)	974031 (90.84)	225130 (88.17)	408216 (91.73)	340685 (91.60)

Variables	Total n= 1072289	Toulouse Métropole n= 255329 (23.81%)	Autres grands pôles urbains n= 445014 (41.5%)	Autres n= 371946 (34.69%)
Mammographie dans l'année				
0, n(%)	905277 (84.42)	218420 (85.54)	371933 (83.58)	314924 (84.67)
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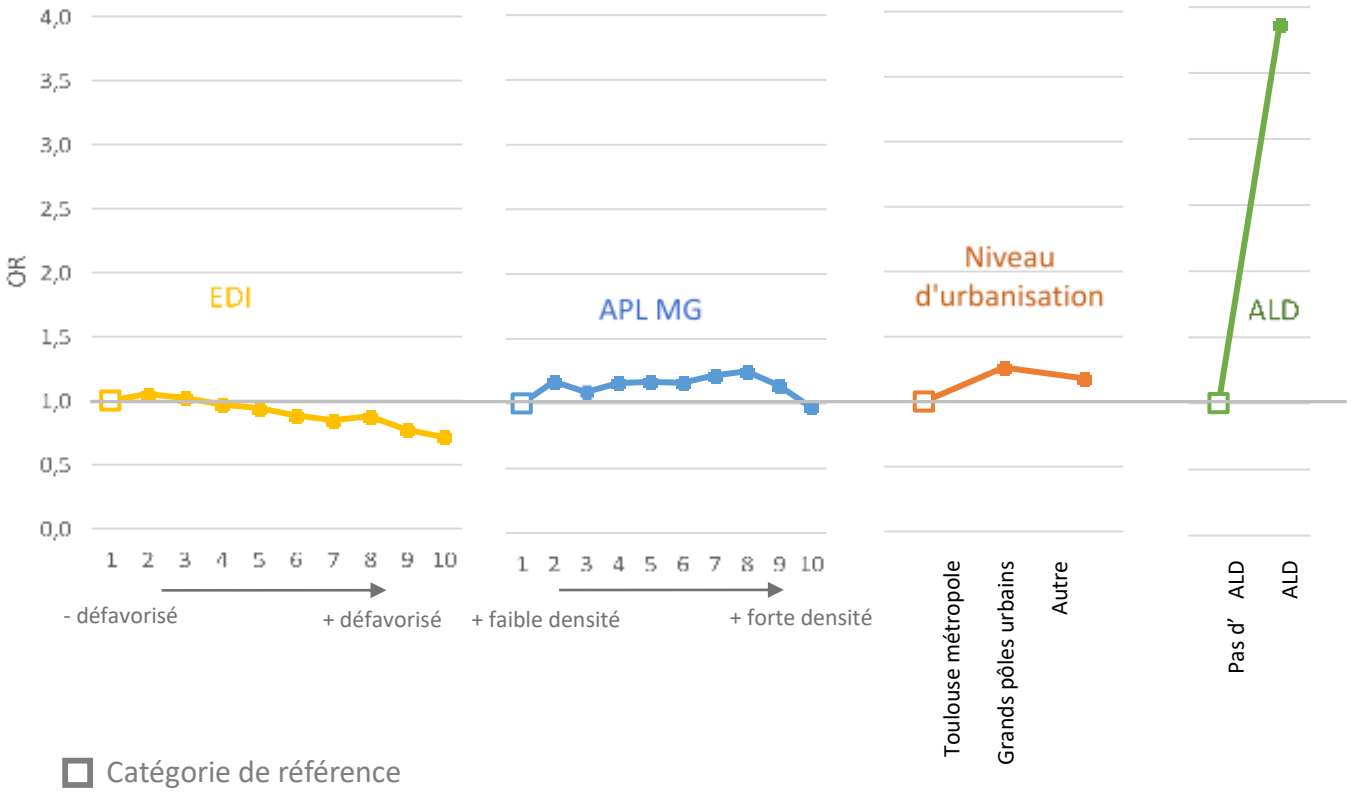
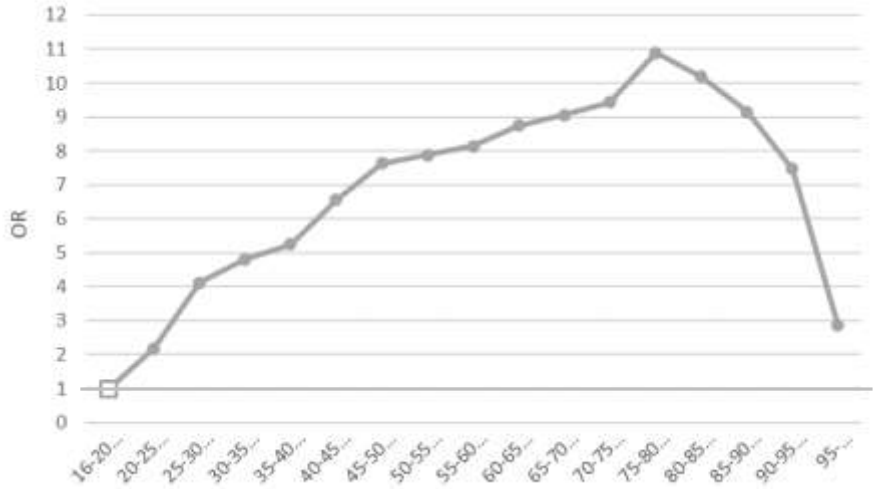
MT déclaré	n= 1072289	n= 255329	n= 445014	n= 371946
Pas de MR déclaré, n(%)	98258 (9.16)	30199 (11.83)	36798 (8.27)	31261 (8.4)
MT déclaré, n(%)	974031 (90.84)	225130 (88.17)	408216 (91.73)	340685 (91.6)
Age				
16-20 ans, n(%)	45262 (4.22)	10195 (3.99)	20332 (4.57)	14735 (3.96)
20-25 ans, n(%)	63068 (5.88)	20599 (8.07)	25719 (5.78)	16750 (4.5)
25-30 ans, n(%)	82413 (7.69)	30798 (12.06)	32111 (7.22)	19504 (5.24)
30-35 ans, n(%)	88249 (8.23)	28146 (11.02)	36721 (8.25)	23382 (6.29)
35-40 ans, n(%)	85200 (7.95)	23292 (9.12)	37351 (8.39)	24557 (6.6)
40-45 ans, n(%)	92964 (8.67)	21537 (8.43)	41983 (9.43)	29444 (7.92)
45-50 ans, n(%)	94291 (8.79)	21259 (8.33)	41829 (9.4)	31203 (8.39)
50-55 ans, n(%)	88241 (8.23)	19112 (7.49)	37568 (8.44)	31561 (8.49)
55-60 ans, n(%)	83126 (7.75)	17097 (6.7)	34985 (7.86)	31044 (8.35)
60-65 ans, n(%)	81209 (7.57)	15774 (6.18)	33460 (7.52)	31975 (8.6)
65-70 ans, n(%)	64794 (6.04)	12305 (4.82)	25825 (5.8)	26664 (7.17)
70-75 ans, n(%)	48577 (4.53)	8631 (3.38)	18917 (4.25)	21029 (5.65)
75-80 ans, n(%)	50815 (4.74)	8793 (3.44)	19298 (4.34)	22724 (6.11)
80-85 ans, n(%)	48148 (4.49)	8049 (3.15)	18163 (4.08)	21936 (5.9)
85-90 ans, n(%)	34698 (3.24)	5890 (2.31)	12760 (2.87)	16048 (4.31)
90-95 ans, n(%)	16602 (1.55)	2927 (1.15)	6229 (1.4)	7446 (2)
95-100 ans, n(%)	4632 (0.43)	925 (0.36)	1763 (0.4)	1944 (0.52)
EDI (déciles)				
1, n(%)	85793 (8)	20810 (8.15)	58041 (13.04)	6942 (1.87)
2, n(%)	100164 (9.34)	26825 (10.51)	58530 (13.15)	14809 (3.98)
3, n(%)	87506 (8.16)	15253 (5.97)	46566 (10.46)	25687 (6.91)
4, n(%)	89339 (8.33)	11428 (4.48)	43729 (9.83)	34182 (9.19)
5, n(%)	96394 (8.99)	28997 (11.36)	34869 (7.84)	32528 (8.75)
6, n(%)	113041 (10.54)	12966 (5.08)	48252 (10.84)	51823 (13.93)
7, n(%)	112486 (10.49)	24398 (9.56)	35706 (8.02)	52382 (14.08)
8, n(%)	110300 (10.29)	24453 (9.58)	32162 (7.23)	53685 (14.43)
9, n(%)	129232 (12.05)	37884 (14.84)	36389 (8.18)	54959 (14.78)
10, n(%)	148034 (13.81)	52315 (20.49)	50770 (11.41)	44949 (12.08)
APL MG (déciles)				
1, n(%)	28746 (2.68)	1118 (0.44)	4594 (1.03)	23034 (6.19)
2, n(%)	36820 (3.43)	3091 (1.21)	13642 (3.07)	20087 (5.4)
3, n(%)	38611 (3.6)	0 (0)	17944 (4.03)	20667 (5.56)
4, n(%)	55032 (5.13)	2371 (0.93)	26811 (6.02)	25850 (6.95)
5, n(%)	73046 (6.81)	4676 (1.83)	40593 (9.12)	27777 (7.47)
6, n(%)	92524 (8.63)	9227 (3.61)	51311 (11.53)	31986 (8.6)
7, n(%)	145227 (13.54)	28333 (11.1)	75106 (16.88)	41788 (11.23)
8, n(%)	184884 (17.24)	51400 (20.13)	74876 (16.83)	58608 (15.76)
9, n(%)	195551 (18.24)	55027 (21.55)	84401 (18.97)	56123 (15.09)
10, n(%)	221848 (20.69)	100086 (39.2)	55736 (12.52)	66026 (17.75)
ALD				
Pas d'ALD, n(%)	880950 (82.16)	218950 (85.75)	368132 (82.72)	293868 (79.01)
ALD, n(%)	191339 (17.84)	36379 (14.25)	76882 (17.28)	78078 (20.99)

Table 1. Table descriptive de la population des plus de 16 ans en Midi-Pyrénées, 2012

Analyses multivariées : Avoir un MT





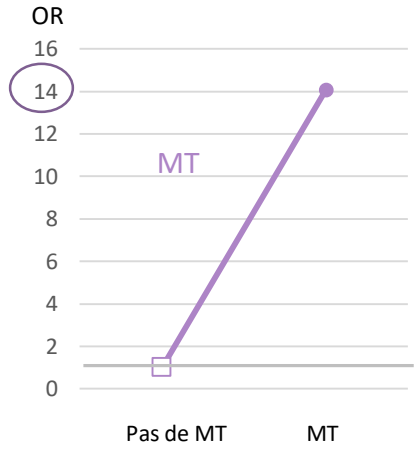
Femmes n'ayant pas de MT :

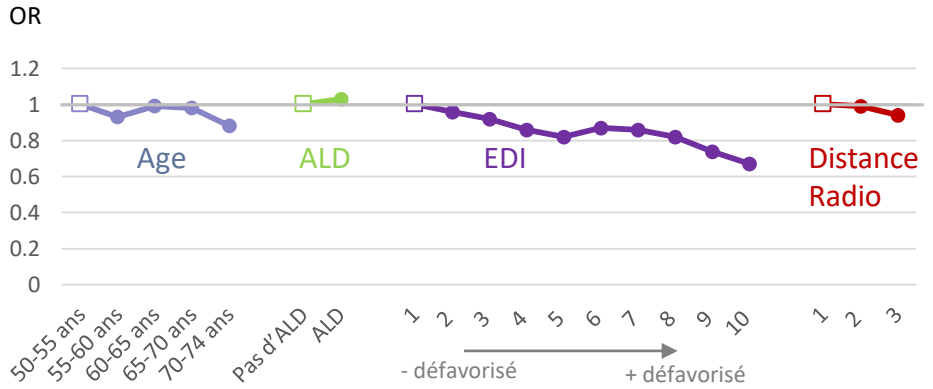
- + jeunes
- + défavorisées
- À Toulouse Métropole
- Meilleur état de santé

Analyse multivariée :

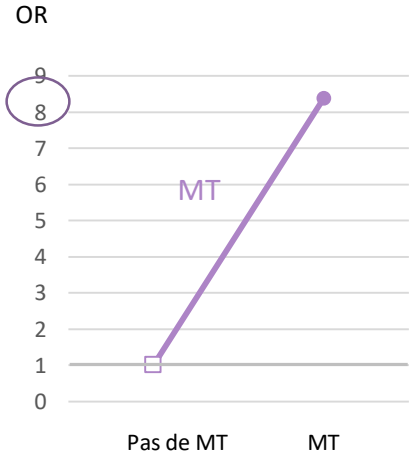
Recours à la mammographie

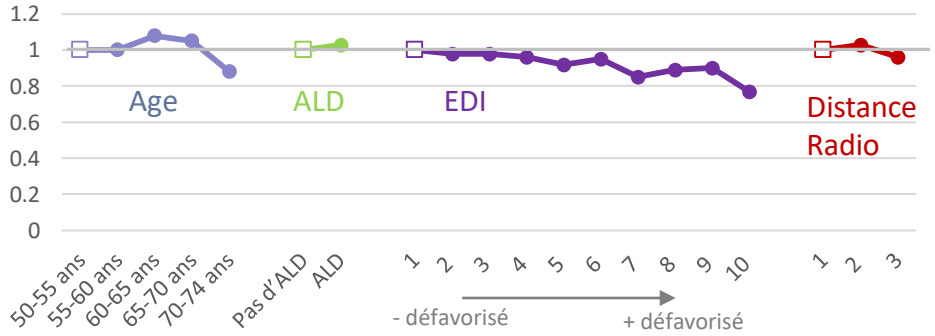
Toulouse Métropole



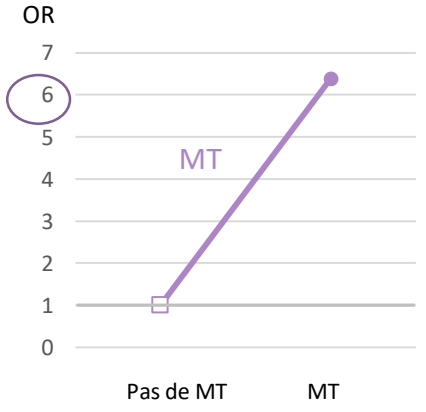


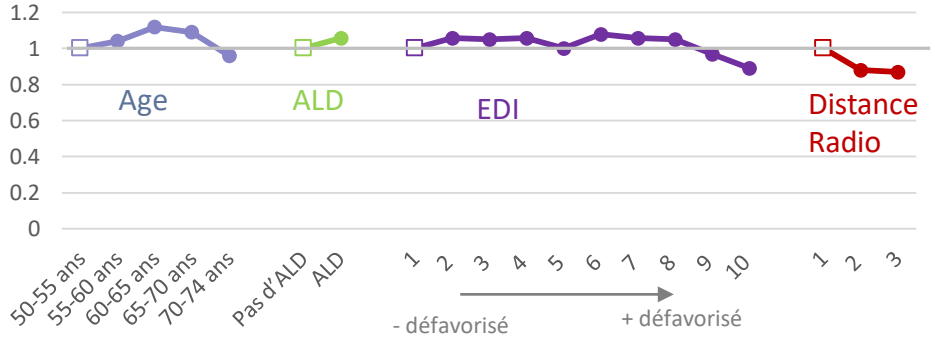
Autres grands pôles urbains





Autre (zones rurales)



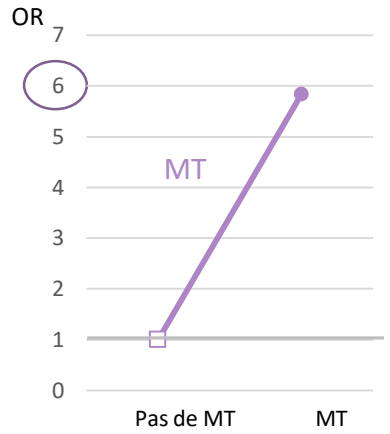


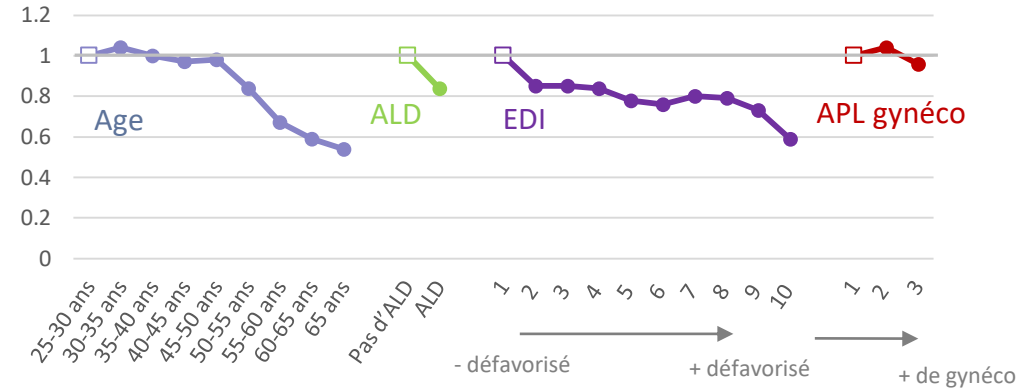
- Catégorie de référence

Analyse multivariée :

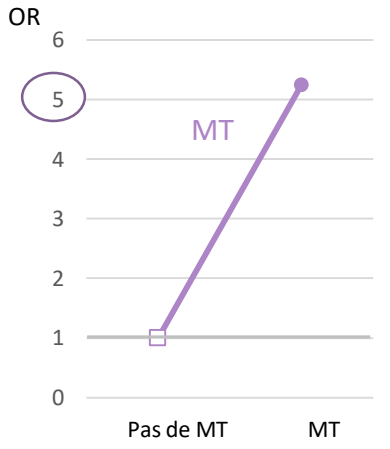
Recours au FCU

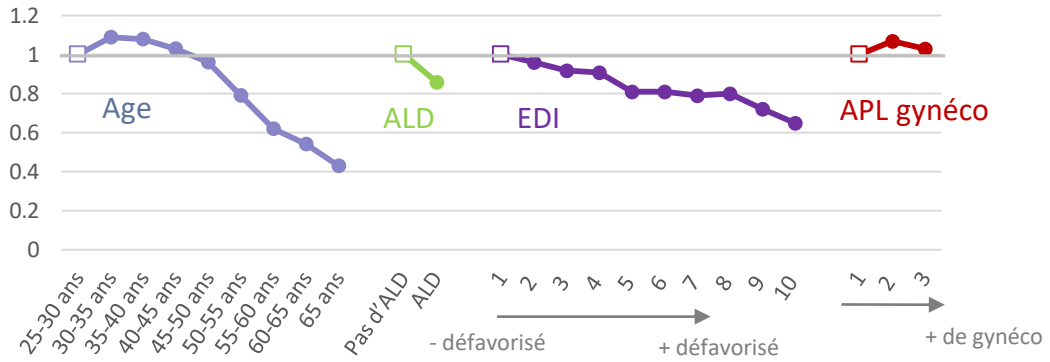
Toulouse Métropole



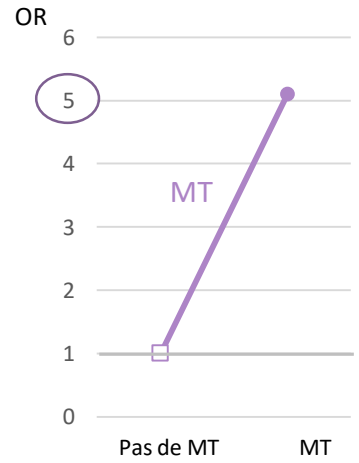


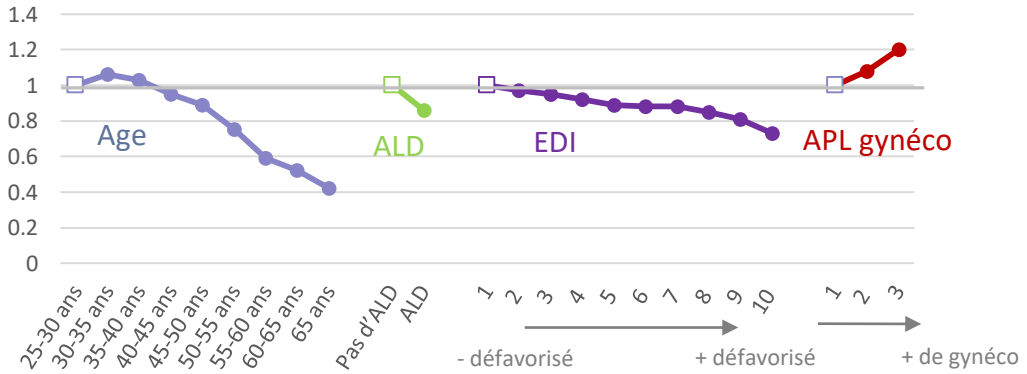
Autres grands pôles urbains





Autre (zones rurales)





- Catégorie de référence

Exploration

→ Exploration du lien “Avoir un MT” → Recours aux dépistages par mammographie et FCU

Annexe 2 : **Recours à la consultation de médecine générale dans l’année chez les femmes avec ou sans médecin traitant déclaré**

	Pas de MT n =98258		MT n = 974031		p-value < 0.001
	Pas de cs MG	>=1 cs MG	Pas de cs MG	>=1 cs MG	
n(%)	65165 (66.32)	33093 (33.70)	157809 (16.20)	816222 (83.80)	

→ Rôle de la consultation avec le MG ?

Analyse multivariée :
Variable combinée

	Mammographie			FCU		
	Toulouse	Grands pôles urbains	Autre	Toulouse	Grandes pôles urbains	Autre
Pas de cs de MG, Pas de MT	1	1	1	1	1	1
cs MG, Pas de MT (OR, IC 95%)	23.288 (16.088;34.592)	12.285 (9.814;15.491)	8.662 (7.079;10.654)	6.824 (6.126;7.607)	6.312 (5.679;7.024)	5.272 (4.668;5.964)
Pas de cs MG, MT (OR, IC 95%)	29.398 (21.348;41.947)	13.613 (11.268;16.634)	8.304 (7.018;9.911)	6.447 (5.919;7.034)	6.929 (6.347;7.58)	6.114 (5.528;6.782)
cs MG, MT (OR, IC 95%)	63.987 (46.644;91.019)	28.977 (24.058;35.312)	19.525 (16.563;23.224)	14.388 (13.261;15.642)	14.125 (12.972;15.416)	12.925 (11.721;14.295)

***Table 4* : Régression logistique multivariée du recours à la mammographie et au FCU en fonction d'une variable combinant avoir un médecin traitant et avoir consulté au moins une fois un MG**
Ajustée sur les facteurs de confusion

Discussion et conclusion

- Recours aux dépistages des femmes avec MT > sans MT
  - Effet « consultation par le MG »
    - Efficacité des soins primaires[3], de la continuité des soins[4]
  - Autre : adhésion au système de soins ?

3 : Starfield B, Shi L, Macinko J. Contribution of primary care to health systems and health. Milbank Q. 2005;83(3):457–502.
4 : Freeman G. What future for continuity of care in general practice? BMJ. 1997. + The impact of referral to a primary physician on cervical cancer screening. American Journal of Public Health. 2001.

- Recours aux dépistages des femmes avec MT > sans MT
  - Effet « consultation par le MG »
    - Efficacité des soins primaires[3], de la continuité des soins[4]
  - Autre : adhésion au système de soins ?
- Disparités territoriales :
  - De recours aux dépistages[5]
  - De déclaration de MT
  - De l'effet d'avoir un MT sur les dépistages

5 : Leung J, McKenzie S, Martin J, McLaughlin D. Effect of rurality on screening for breast cancer: a systematic review and meta-analysis comparing mammography. Rural Remote Health. 2014;14(2):2730.
Ouédraogo S, Dabakuyo-Yonli TS, Roussot A, Dialla PO, Pornet C, Poillot M-L, et al. [Breast cancer screening in thirteen French departments]. Bull Cancer. 2015 Feb;102(2):126–38

- Recours aux dépistages des femmes avec MT > sans MT
  - ➢ Effet « consultation par le MG »
    - ➢ Efficacité des soins primaires[3], de la continuité des soins[4]
  - ➢ Autre : adhésion au système de soins ?
- Disparités territoriales :
  - De recours aux dépistages[5]
  - De déclaration de MT
  - De l'effet d'avoir un MT sur les dépistages
- Disparités sociales :
  - Gradient social de recours à la mammographie et au FCU[6]
  - Gradient social de déclaration de MT
  - Difficultés d'éducation/prévention par MG[7]

6 : Smith D. The breast cancer paradox: A systematic review of the association between area-level deprivation and breast cancer screening uptake in Europe. Cancer Epidemiol. 2019;60:77–85.
7 : Heremans P, Deccache A. Mieux intégrer la prévention en médecine générale dans les milieux défavorisés (1).

Forces et limites

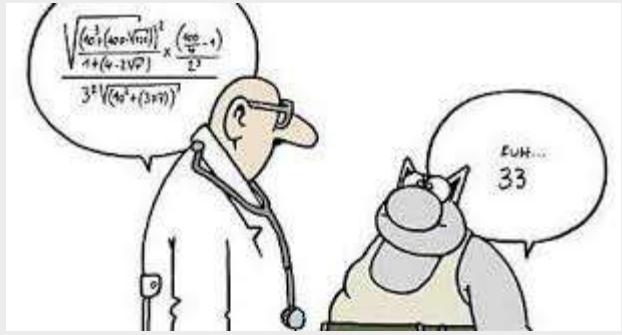
- Sujet innovant
- Puissance et exhaustivité
- Prise en compte du statut socio-économique

- Données collectées pendant une année
- Manque de données sur les MT
- Manque de données reflétant l'adhésion globale au système de soins

Pistes d'amélioration

- Déclaration de MT : rappels et aides
- Continuité des soins : consultations régulières avec MT
- Temps dédiés à la prévention
- Outils d'aide au suivi des patients
- Populations de bas niveau socio-économique

→
  - Opportunités à saisir
  - Prévention au premier plan
  - Communication



Merci

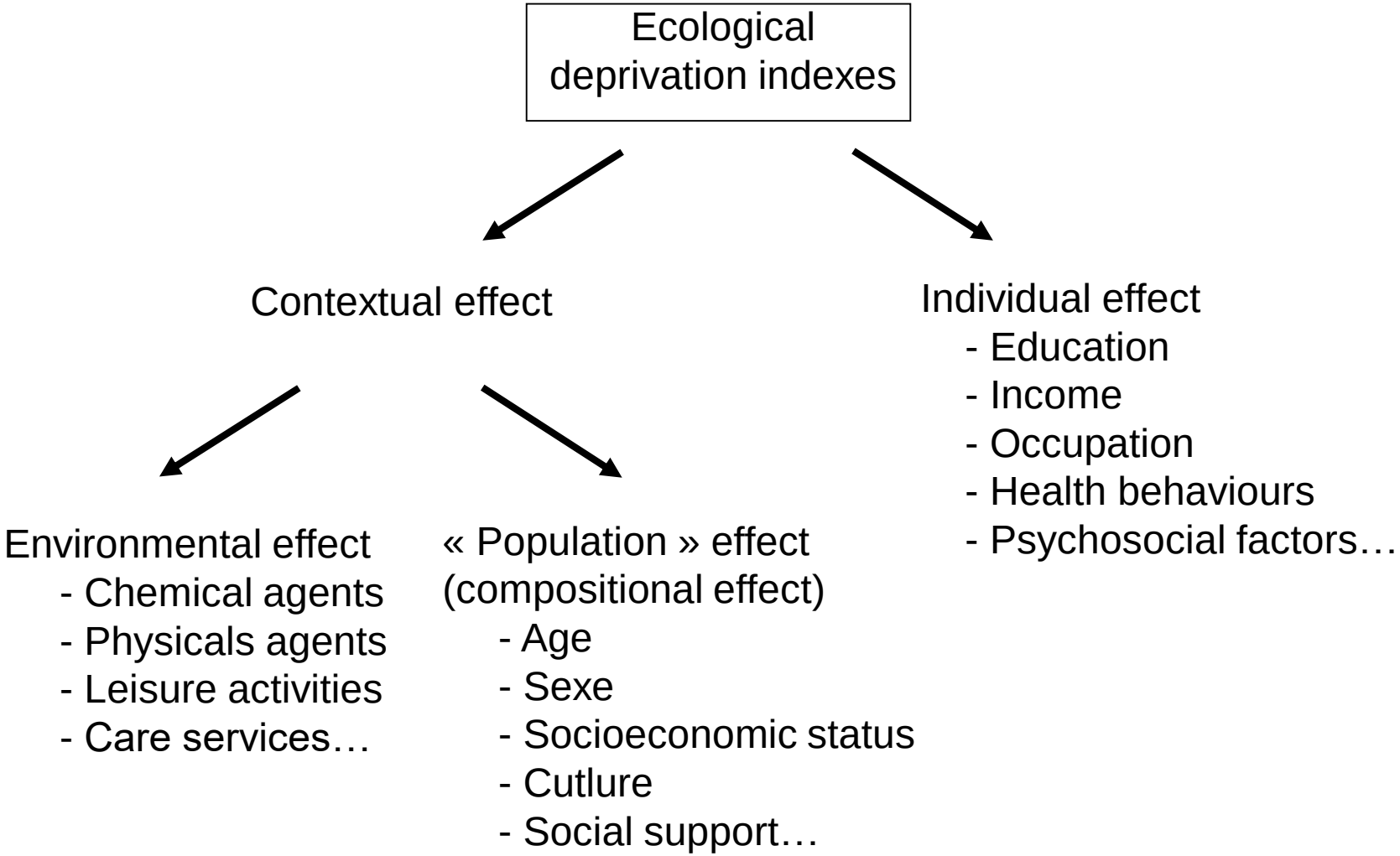

Ecological deprivation indexes
Contextual effect
Individual effect
- Education
- Income
- Occupation
- Health behaviours
- Psychosocial factors…
Environmental effect
- Chemical agents
- Physicals agents
- Leisure activities
- Care services…
« Population » effect (compositional effect)
- Age
- Sexe
- Socioeconomic status
- Cutlure
- Social support…

Table 2 : **Régression logistique multivariée : Recours à la mammographie selon le lieu de résidence**

		Toulouse Métropole		Autres grands pôles urbains		Autre (zones non urbaines)	
		Tot= 72 919	OR (95%CI)	Tot= 150 755	OR (95%CI)	Tot= 142 273	OR (95%CI)
MT déclaré	Non[1]	4898	1	7428	1	7706	1
	Oui	68021	14.094 (12.11;16.524)	143327	8.387 (7.601;9.282)	134567	6.376 (5.819;7.003)
Age	50-55 ans[1]	19112	1	37568	1	31561	1
	55-60 ans	17097	0.934 (0.893;0.977)	34985	1.004 (0.973;1.036)	31044	1.039 (1.003;1.076)
	60-65 ans	15774	0.987 (0.942;1.033)	33460	1.078 (1.045;1.113)	31975	1.123 (1.085;1.163)
	65-70 ans	12305	0.982 (0.935;1.032)	25825	1.047 (1.011;1.083)	26664	1.092 (1.053;1.133)
	70-74 ans	8631	0.878 (0.829;0.929)	18917	0.881 (0.847;0.915)	21029	0.962 (0.924;1.001)
ALD	Pas d'ALD[1]	57407	1	117379	1	110515	1
	ALD	15512	1.028 (0.988;1.069)	33376	1.034 (1.007;1.062)	31758	1.065 (1.036;1.095)
EDI (déciles)	1[1]	7886	1	20596	1	2719	1
	2	8615	0.959 (0.898;1.023)	20315	0.983 (0.943;1.024)	5896	1.064 (0.963;1.177)
	3	4436	0.922 (0.852;0.997)	15563	0.982 (0.939;1.026)	10112	1.05 (0.956;1.153)
	4	3484	0.864 (0.793;0.941)	14848	0.956 (0.913;1.001)	13232	1.062 (0.97;1.165)
	5	8183	0.823 (0.77;0.879)	11820	0.916 (0.872;0.962)	12730	1.002 (0.914;1.1)
	6	3368	0.869 (0.796;0.948)	16244	0.951 (0.91;0.994)	19906	1.075 (0.984;1.176)
	7	6678	0.864 (0.804;0.928)	12055	0.846 (0.805;0.889)	20092	1.062 (0.972;1.161)
	8	6367	0.822 (0.763;0.886)	10760	0.885 (0.841;0.932)	20741	1.047 (0.959;1.145)
	9	9519	0.742 (0.693;0.793)	12192	0.901 (0.856;0.948)	20679	0.967 (0.885;1.057)
	10	14383	0.673 (0.634;0.715)	16362	0.771 (0.734;0.81)	16166	0.886 (0.809;0.97)
Distance (temps) au cabinet de radiologie (terciles)	1[1]	24324	1	50709	1	47439	1
	2	24510	0.986 (0.947;1.027)	50400	1.03 (0.999;1.061)	47456	0.884 (0.859;0.909)
	3	24085	0.938 (0.899;0.979)	49646	0.956 (0.928;0.985)	47378	0.872 (0.847;0.897)

[1] *: catégorie de référence*

Table 3 : **Régression logistique multivariée de recours au FCU selon le lieu de résidence**

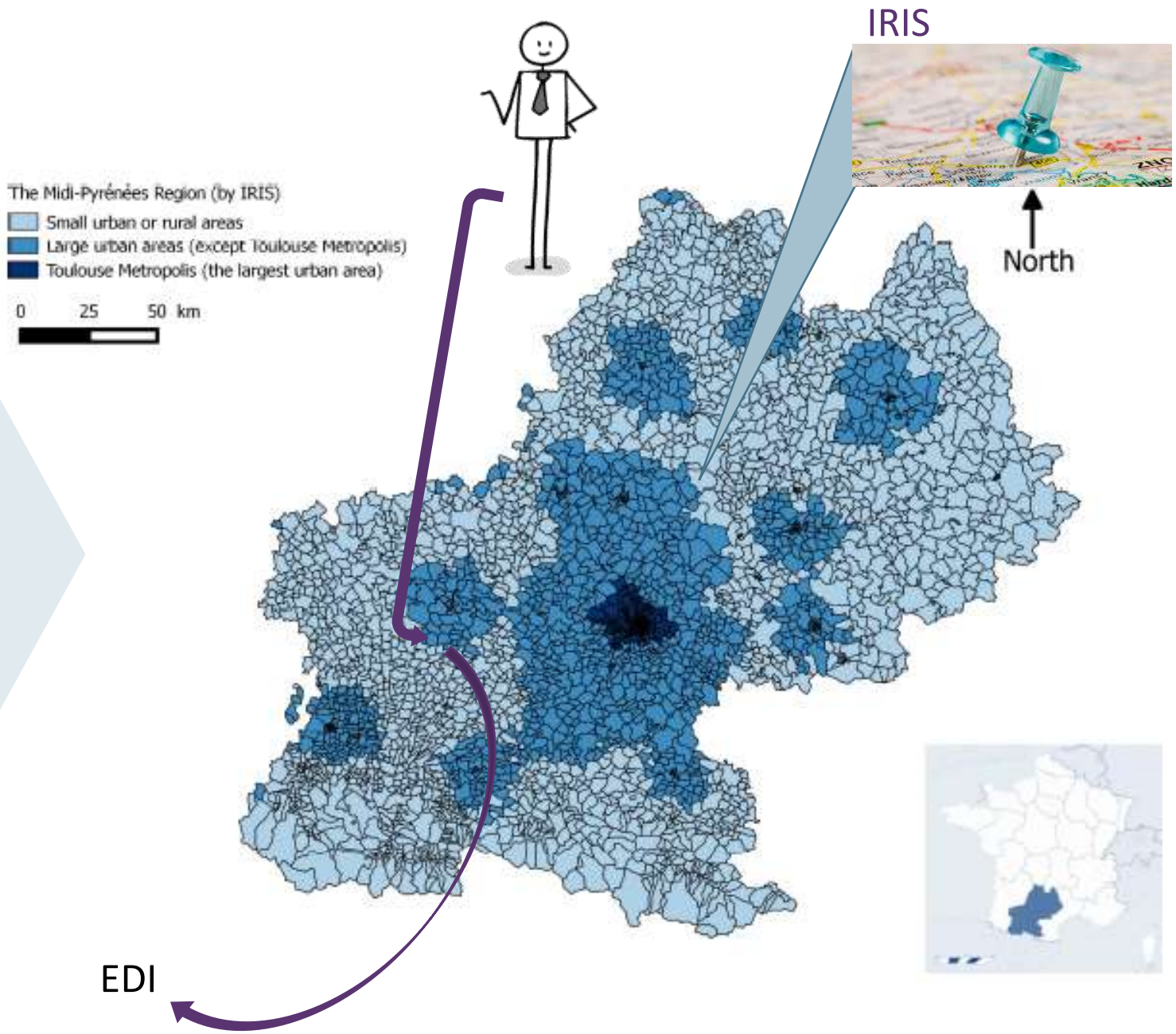
		Toulouse Métropole		Autres grands pôles urbains		Autre (zones non urbaines)	
		Tot= 180	OR (95%CI)	Tot= 302563	OR (95%CI)	Tot= 229 210	OR (95%CI)
MT déclaré	Non[1]	18754	1	20659	1	18183	1
	Oui	161276	5.838 (5.54;6.156)	281904	5.254 (5.002;5.523)	211027	5.099 (4.814;5.406)
Age	25-30 ans [1]	30798	1	32111	1	19504	1
	30-35 ans	28146	1.04 (1.004;1.077)	36721	1.092 (1.058;1.128)	23382	1.064 (1.019;1.11)
	35-40 ans	23292	0.996 (0.959;1.033)	37351	1.075 (1.041;1.11)	24557	1.032 (0.989;1.076)
	40-45 ans	21537	0.973 (0.937;1.011)	41983	1.025 (0.994;1.058)	29444	0.955 (0.917;0.995)
	45-50 ans	21259	0.982 (0.946;1.02)	41829	0.959 (0.929;0.99)	31203	0.885 (0.85;0.922)
	50-55 ans	19112	0.842 (0.809;0.876)	37568	0.785 (0.76;0.811)	31561	0.747 (0.716;0.778)
	55-60 ans	17097	0.673 (0.645;0.702)	34985	0.622 (0.601;0.644)	31044	0.59 (0.566;0.616)
	60-65 ans	15774	0.595 (0.569;0.622)	33460	0.538 (0.519;0.558)	31975	0.52 (0.498;0.543)
	65 ans	3015	0.537 (0.49;0.587)	6555	0.43 (0.401;0.46)	6540	0.416 (0.385;0.449)
ALD	Pas d'ALD[1]	162439	1	268275	1	201462	1
	ALD	17591	0.835 (0.806;0.866)	34288	0.86 (0.838;0.883)	27748	0.863 (0.836;0.891)
EDI (déciles)	1[1]	14747	1	42750	1	4741	1
	2	19389	0.855 (0.817;0.894)	41657	0.958 (0.93;0.986)	9906	0.971 (0.898;1.05)
	3	10922	0.846 (0.802;0.892)	32952	0.918 (0.89;0.947)	16889	0.95 (0.883;1.022)
	4	8239	0.837 (0.79;0.886)	30690	0.91 (0.881;0.939)	21643	0.924 (0.86;0.992)
	5	21020	0.777 (0.742;0.813)	23450	0.812 (0.784;0.841)	20561	0.894 (0.832;0.961)
	6	9173	0.762 (0.719;0.807)	32475	0.814 (0.789;0.84)	31816	0.879 (0.82;0.942)
	7	17062	0.802 (0.762;0.843)	23586	0.788 (0.761;0.816)	31628	0.876 (0.818;0.939)
	8	17051	0.787 (0.749;0.828)	20967	0.795 (0.766;0.825)	32394	0.85 (0.793;0.911)
	9	26337	0.73 (0.695;0.766)	22732	0.721 (0.695;0.748)	33163	0.813 (0.759;0.872)
	10	36090	0.59 (0.563;0.618)	31304	0.653 (0.631;0.676)	26469	0.734 (0.684;0.788)
APL au gynécologue (terciles)	1[1]	60220	1	101380	1	76583	1
	2	60824	1.045 (1.016;1.075)	102717	1.073 (1.052;1.094)	78139	1.082 (1.057;1.108)
	3	58986	0.956 (0.926;0.987)	98466	1.03 (1.009;1.051)	74488	1.201 (1.173;1.231)

[1] : *catégorie de référence*

	Mammographie			FCU		
	Toulouse	Grands pôles urbains	Autre	Toulouse	Grandes pôles urbains	Autre
Pas de cs de MG, Pas de MT	1	1	1	1	1	1
cs MG, Pas de MT (OR, IC 95%)	23.288 (16.088;34.592)	12.285 (9.814;15.491)	8.662 (7.079;10.654)	6.824 (6.126;7.607)	6.312 (5.679;7.024)	5.272 (4.668;5.964)
Pas de cs MG, MT (OR, IC 95%)	29.398 (21.348;41.947)	13.613 (11.268;16.634)	8.304 (7.018;9.911)	6.447 (5.919;7.034)	6.929 (6.347;7.58)	6.114 (5.528;6.782)
cs MG, MT (OR, IC 95%)	63.987 (46.644;91.019)	28.977 (24.058;35.312)	19.525 (16.563;23.224)	14.388 (13.261;15.642)	14.125 (12.972;15.416)	12.925 (11.721;14.295)

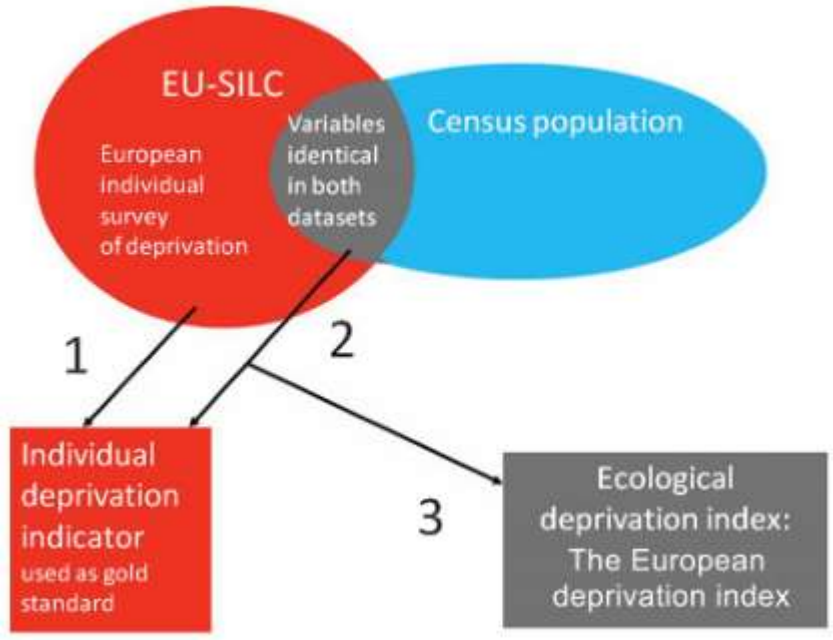
Table 4 **: Régression logistique multivariée du recours à la mammographie et au FCU en fonction d'une variable combinant avoir un médecin traitant et avoir consulté au moins une fois un MG**
Ajustée sur les facteurs de confusion

EDI… un indice écologique de défavorisation



1: Pornet C, et al. Construction of an adaptable European transnational ecological deprivation index: the French version. J Epidemiol Community Health. 2012 Nov;66(11):982–9.

Construction of EDI



1. Construction of an individual deprivation indicator.

    1.1. Identification of **people's fundamental needs** by using a European survey specifically designed to study deprivation, because no gold standard of deprivation exists.

    1.2. Selection of fundamental needs that were **associated with both objective and subjective poverty**, because deprivation is not only determined by income.

    1.3. Definition of a **binary individual deprivation indicator** from these fundamental needs associated with both objective and subjective poverty.

2. Identification and dichotomisation of **variables available both at an individual level** (French European UnioneStatistics on Income and Living Conditions; EUeSILC) **and in census**, these variables having to be phrased and coded in the same way in both the census population and the EUeSILC survey.

3. Construction of an **ecological** deprivation index, the European deprivation index (EDI).

    3.1. **Selection and weighting** of those variables associated with the individual deprivation indicator using multivariate logistic regression.

    3.2. Ecological step: the regression coefficients associated with these variables in the final model become the weights of these variables measured at the aggregated level in the ecological index.

EDI: Selection of variables available both at individual level and in the French census

Eleven variables were phrased and coded in the same way in both the census population at IRIS level and the EUeSILC survey:

- Five dichotomous variables:
  - < Education: ‘Low level of education’, ie, less than first stage of secondary-level education, versus ‘all other levels of education’
  - < Overcrowded housing: ‘More than 1 person per room’ versus ‘1 or less person per room’
  - < Heating: ‘No access to a system of central or electric heating’ versus ‘access to a system of central or electric heating’
  - < Car: ‘No access to a car’ versus ‘access to a car’
  - < Nationality: ‘Foreign nationality’ versus ‘French nationality’

- And six unordered variables with two or more categories:
  - < Occupational classes in 10 categories
  - < Household types (single pensioner/single-parent household/ couple without children/couple with child(ren)/without family)
  - < Number of persons in household ($2 persons/$3 persons/$4 persons/$5 persons/$6 persons)
  - < Employment status (employment/unemployment/retired/other non-working individuals)
  - < Tenure (owners/renters at market prices/renters in low-rent community housing/accommodated free of charge)
  - < Basic amenities (no exclusive use of indoor toilet/no exclusive use of bath or shower)

EDI vs other ecological deprivation indexes

Nom Indice	Est-ce une méthodologie de construction ou un indicateur ?	Objectif(s)	Sources	Population(s)	Année(s)	Echelle(s)	Variables	Méthodes	Cible
Fdep French Depriv.Index	Indicateur	Indice de désavantage social dont l'assoc. rural/urbain est homogène	Recensement	France métr.	1990 1999 2008 2013	IRIS Commune Canton Département	% chômeurs % ouvriers % Bacheliers Revenu médian par UC	ACP pondérée population	Population France
French EDI European Depriv. Index	Méthodologie et indicateur	Proxy indiv. désav. basé sur une perception individuelle du désav. définie au niveau national	Indiv. : Enquête EU-SILC Ecolog. : Recensement	Indiv. : Echantillon UE Ecolog. : France métr.	2007	IRIS	Sélection France : % étrangers Indic cond. logement % sans sanitaire % Foyers monopar. % nonpropr % foyer sans voit. % chômeurs % sans dipl. d'étude sup. % ouvriers non qualif.	Procédure*	Pop. France Pop. nationales UE
Lalloue	Méthodologie et indicateur	Indice socio-éco par quartier en zone urbaine	Recensement	Lille Métropole, Aix-Marseille, Grand Lyon	1999	IRIS	Sélection sur 48 variables*	Procédure*	Population urbaine France
Townsend	Méthodologie de construction et indicateur	Indice de désavantage social	Recensement	France métr.		Iris, commune	% de chômeurs % ménages sans voiture % de ménages non-propr. % de ménages en logement surpeupl	log-transform. Z-score	Population Royaume-Uni

PLA building

- Healthcare supply quantification
- Healthcare demand
- Supply/offer interaction: distance weighted supply (w)

$$APL_i = \sum_{d_{ij} < d_0} w(d_{ij}) R_j$$

$$R_j = \frac{m_j}{\sum_{d_{ij} < d_0} p_i * w(d_{ij})}$$

Mj: supply in full time equivalents in j
Do: reference distance threshold
Pi: number of inhabitants standardised on their age in i (with i-j < d0)
Dij: access distance

Flow chart

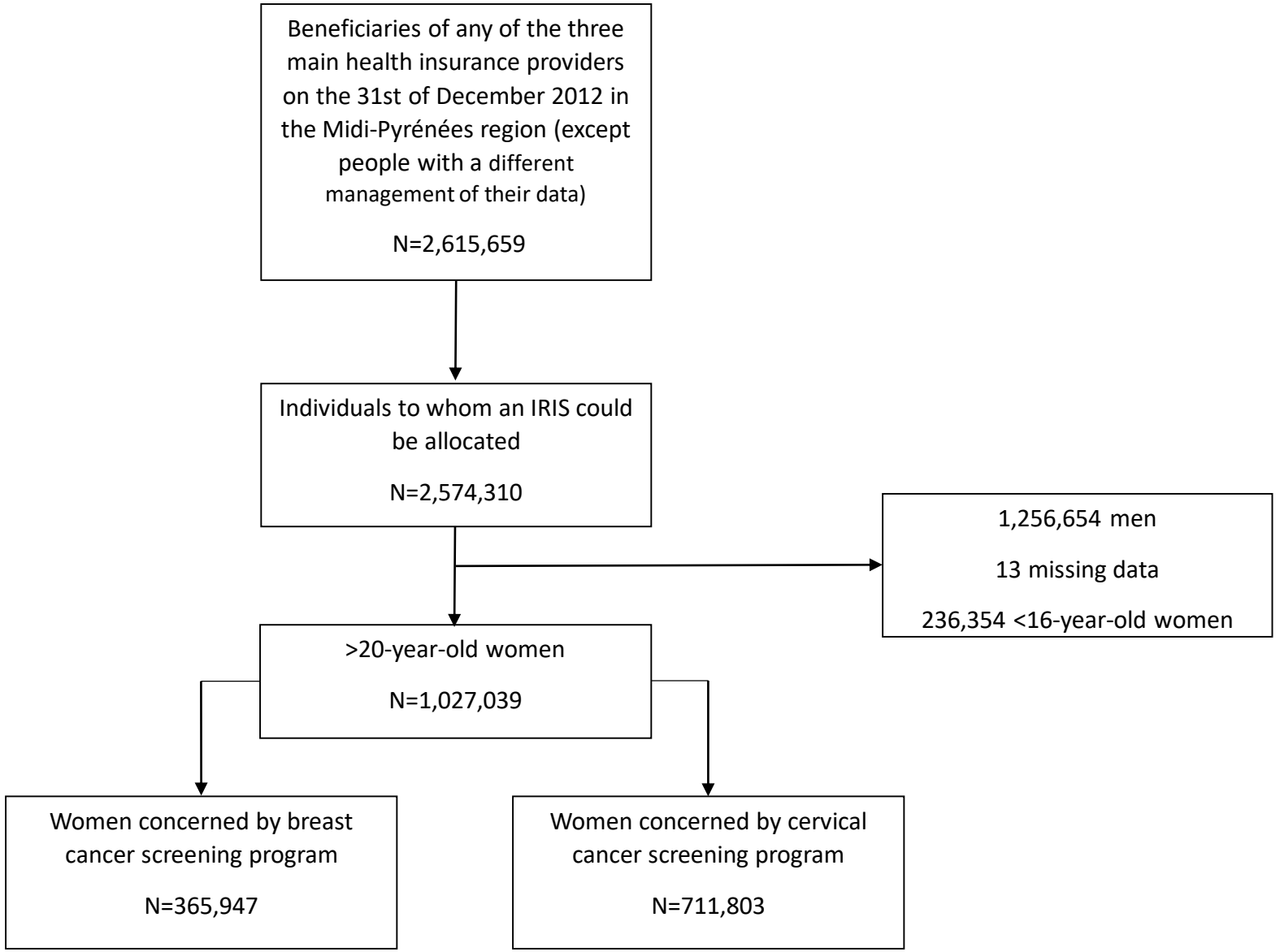

Beneficiaries of any of the three main health insurance providers on the 31st of December 2012 in the Midi-Pyrénées region (except people with a different management of their data)
N=2,615,659
Individuals to whom an IRIS could be allocated
N=2,574,310
1,256,654 men
13 missing data
236,354 <16-year-old women
>20-year-old women
N=1,027,039
Women concerned by breast cancer screening program
N=365,947
Women concerned by cervical cancer screening program
N=711,803

Table2: Mammography uptake in recommended age group: multivariable logistic regression models (mammography uptake = 30.77%)

			N	Model 1	LogLik	Model 2	LogLik	Model 3	LogLik	Model 4	LogLik	Model 5	LogLik
			Tot= 365947	OR (95%CI)	-225465	OR (95%CI)	-225373	OR (95%CI)	-225160	OR (95%CI)	-225115	OR (95%CI)	-220891
Combined EDI and large urban/other areas	**EDI (deciles) in large urban areas**	1[3]	2 719	1		1		1		1		1	
		2	5 896	0.981 [0.948,1.016]		0.982 (0.948,1.016)		0.983 (0.95,1.018)		0.983 (0.949,1.018)		0.976 (0.942,1.011)	
		3	10 112	0.967 [0.931,1.005]		0.968 (0.932,1.006)		0.971 (0.934,1.009)		0.968 (0.932,1.007)		0.962 (0.925,1)	
		4	13 232	0.933 [0.897,0.97]		0.934 (0.898,0.971)		0.939 (0.902,0.976)		0.934 (0.897,0.971)		0.927 (0.891,0.965)	
		5	12 730	0.889 [0.856,0.924]		0.89 (0.857,0.925)		0.897 (0.863,0.933)		0.9 (0.865,0.936)		0.897 (0.862,0.933)	
		6	19 906	0.928 [0.893,0.965]		0.929 (0.894,0.966)		0.936 (0.901,0.973)		0.932 (0.896,0.969)		0.927 (0.891,0.964)	
		7	20 092	0.849 [0.816,0.883]		0.85 (0.817,0.884)		0.858 (0.825,0.892)		0.861 (0.826,0.896)		0.864 (0.83,0.9)	
		8	20 741	0.872 [0.837,0.908]		0.873 (0.838,0.909)		0.885 (0.85,0.922)		0.893 (0.857,0.931)		0.895 (0.858,0.933)	
		9	20 679	0.838 [0.807,0.871]		0.84 (0.809,0.872)		0.855 (0.823,0.888)		0.86 (0.827,0.895)		0.867 (0.833,0.903)	
		10	16 166	0.733 [0.708,0.759]		0.734 (0.709,0.76)		0.763 (0.737,0.79)		0.771 (0.742,0.801)		0.777 (0.748,0.808)	
	EDI (deciles) in other areas	1	28 482	0.782 [0.718,0.853]		0.783 (0.718,0.854)		0.784 (0.719,0.855)		0.811 (0.743,0.884)		0.808 (0.74,0.882)	
		2	28 930	0.841 [0.791,0.893]		0.842 (0.792,0.894)		0.845 (0.795,0.897)		0.861 (0.81,0.915)		0.855 (0.804,0.91)	
		3	19 999	0.814 [0.775,0.855]		0.814 (0.775,0.855)		0.817 (0.778,0.858)		0.838 (0.798,0.881)		0.834 (0.793,0.877)	
		4	18 332	0.829 [0.793,0.866]		0.829 (0.793,0.867)		0.833 (0.797,0.871)		0.845 (0.808,0.883)		0.84 (0.803,0.879)	
		5	10 003	0.777 [0.742,0.813]		0.777 (0.742,0.813)		0.78 (0.746,0.817)		0.797 (0.761,0.835)		0.794 (0.758,0.832)	
		6	19 612	0.831 [0.799,0.864]		0.832 (0.801,0.866)		0.838 (0.805,0.871)		0.847 (0.815,0.881)		0.846 (0.813,0.881)	
		7	18 733	0.816 [0.785,0.848]		0.817 (0.786,0.85)		0.824 (0.792,0.857)		0.834 (0.801,0.867)		0.829 (0.797,0.863)	
		8	17 127	0.824 [0.793,0.857]		0.825 (0.794,0.858)		0.833 (0.802,0.866)		0.846 (0.813,0.88)		0.842 (0.809,0.876)	
		9	21 711	0.751 [0.722,0.78]		0.751 (0.722,0.781)		0.762 (0.733,0.792)		0.767 (0.737,0.798)		0.767 (0.737,0.799)	
		10	30 745	0.702 [0.672,0.732]		0.703 (0.674,0.734)		0.718 (0.688,0.75)		0.729 (0.698,0.762)		0.726 (0.694,0.759)	
Age		50-55 y.o.[3]	88 241			1		1		1		1	
		55-60 y.o.	83 126			1.006 (0.985; 1.027)		1.002 (0.982; 1.023)		1.002 (0.982; 1.023)		0.997 (0.977; 1.018)	
		60-65 y.o.	81 209			1.088 (1.066; 1.111)		1.077 (1.055; 1.099)		1.077 (1.055; 1.1)		1.066 (1.044; 1.088)	
		65-70 y.o.	64 794			1.07 (1.047; 1.094)		1.052 (1.029; 1.076)		1.052 (1.029; 1.076)		1.035 (1.012; 1.058)	
		70-75 y.o.	48 577			0.938 (0.916; 0.961)		0.919 (0.897; 0.942)		0.919 (0.897; 0.942)		0.897 (0.875; 0.919)	
CMU-C		No[3]	351 872					1		1		1	
		Yes	14 075					0.659 (0.633; 0.686)		0.659 (0.633; 0.687)		0.644 (0.618; 0.671)	
GP PLA (deciles)		1[3]	11 427							1		1	
		2	13 767							1.023 (0.968; 1.081)		1.013 (0.958; 1.072)	
		3	14 455							1.027 (0.972; 1.084)		1.018 (0.964; 1.076)	
		4	20 582							1.068 (1.015; 1.124)		1.054 (1.002; 1.11)	
		5	26 405							1.111 (1.058; 1.167)		1.102 (1.048; 1.158)	
		6	32 262							1.118 (1.066; 1.173)		1.103 (1.051; 1.158)	
		7	50 863							1.14 (1.089; 1.194)		1.126 (1.075; 1.18)	
		8	62331							1.143 (1.092; 1.195)		1.126 (1.076; 1.179)	
		9	64 131							1.106 (1.057; 1.157)		1.096 (1.047; 1.148)	
		10	69 724							1.081 (1.033; 1.132)		1.081 (1.032; 1.132)	
Referring physician		No[3]	20 032									1	
		Yes	345 915									8.45 (7.946; 8.996)	

[3] Reference category

Table 3: Pap smear uptake multivariable logistic regression models in recommended age group (Pap smear uptake = 28.81%)

			N	Model 1	LogLik	Model 2	LogLik	Model 3	LogLik	Model 4	LogLik	Model 5	LogLik
			Total= 711803	OR (95%CI)	-424737	OR (95%CI)	-420964	OR (95%CI)	-420368	OR (95%CI)	-420310	OR (95%CI)	-411557
Combined EDI and large urban/other areas	**EDI (deciles) in large urban area**	1[4]	4 741	1		1		1		1		1	
		2	9 906	0.945 (0.923,0.968)		0.936 (0.914,0.959)		0.939 (0.917,0.962)		0.929 (0.907,0.952)		0.922 (0.899,0.945)	
		3	16 889	0.918 (0.894,0.942)		0.902 (0.879,0.927)		0.908 (0.884,0.932)		0.897 (0.873,0.921)		0.889 (0.865,0.913)	
		4	21 643	0.887 (0.863,0.912)		0.878 (0.854,0.902)		0.886 (0.862,0.91)		0.878 (0.854,0.903)		0.873 (0.849,0.898)	
		5	20 561	0.833 (0.811,0.855)		0.816 (0.795,0.838)		0.826 (0.804,0.848)		0.817 (0.795,0.839)		0.816 (0.794,0.839)	
		6	31 816	0.793 (0.772,0.815)		0.781 (0.76,0.803)		0.792 (0.771,0.814)		0.78 (0.759,0.802)		0.781 (0.759,0.803)	
		7	31 628	0.801 (0.78,0.823)		0.788 (0.766,0.81)		0.8 (0.778,0.822)		0.791 (0.769,0.813)		0.805 (0.782,0.828)	
		8	32 394	0.806 (0.784,0.829)		0.788 (0.766,0.81)		0.806 (0.783,0.828)		0.801 (0.778,0.824)		0.81 (0.787,0.834)	
		9	33 163	0.735 (0.716,0.754)		0.716 (0.698,0.735)		0.738 (0.719,0.758)		0.729 (0.709,0.749)		0.748 (0.727,0.769)	
		10	26 469	0.616 (0.601,0.631)		0.602 (0.588,0.618)		0.643 (0.627,0.659)		0.636 (0.619,0.653)		0.66 (0.642,0.679)	
	EDI (deciles) in other area	1	57 497	0.723 (0.678,0.773)		0.735 (0.688,0.785)		0.737 (0.69,0.787)		0.749 (0.701,0.801)		0.747 (0.699,0.799)	
		2	61 046	0.703 (0.671,0.738)		0.72 (0.686,0.755)		0.724 (0.69,0.759)		0.731 (0.697,0.767)		0.732 (0.697,0.768)	
		3	43 874	0.685 (0.659,0.711)		0.704 (0.677,0.731)		0.707 (0.681,0.735)		0.715 (0.688,0.744)		0.716 (0.689,0.745)	
		4	38929	0.667 (0.644,0.69)		0.684 (0.661,0.709)		0.69 (0.666,0.714)		0.693 (0.669,0.718)		0.693 (0.669,0.718)	
		5	44470	0.628 (0.606,0.651)		0.645 (0.623,0.669)		0.65 (0.627,0.674)		0.655 (0.631,0.679)		0.659 (0.635,0.683)	
		6	41648	0.608 (0.59,0.627)		0.626 (0.607,0.645)		0.632 (0.613,0.652)		0.631 (0.611,0.651)		0.637 (0.617,0.657)	
		7	40648	0.619 (0.6,0.638)		0.637 (0.618,0.657)		0.647 (0.628,0.668)		0.646 (0.626,0.666)		0.648 (0.628,0.669)	
		8	38018	0.591 (0.574,0.61)		0.61 (0.591,0.629)		0.621 (0.602,0.641)		0.62 (0.601,0.64)		0.622 (0.603,0.642)	
		9	49069	0.559 (0.542,0.577)		0.573 (0.556,0.591)		0.588 (0.57,0.607)		0.582 (0.564,0.601)		0.59 (0.571,0.609)	
		10	67394	0.524 (0.506,0.542)		0.533 (0.516,0.552)		0.556 (0.537,0.575)		0.552 (0.533,0.572)		0.562 (0.542,0.582)	
Age		25-30 y.o.[4]	82413			1		1		1		1	
		30-35 y.o.	88249			1.084 (1.062; 1.106)		1.08 (1.059; 1.103)		1.081 (1.059; 1.104)		1.06 (1.038; 1.082)	
		35-40 y.o.	85200			1.063 (1.042; 1.085)		1.056 (1.035; 1.078)		1.057 (1.035; 1.079)		1.021 (1; 1.043)	
		40-45 y.o.	92964			1.031 (1.01; 1.052)		1.021 (1; 1.042)		1.021 (1.001; 1.042)		0.963 (0.944; 0.984)	
		45-50 y.o.	94291			0.988 (0.968; 1.008)		0.975 (0.955; 0.995)		0.975 (0.956; 0.996)		0.906 (0.888; 0.925)	
		50-55 y.o.	88241			0.826 (0.809; 0.843)		0.811 (0.794; 0.828)		0.812 (0.795; 0.829)		0.749 (0.733; 0.765)	
		55-60 y.o.	83126			0.655 (0.64; 0.669)		0.641 (0.627; 0.655)		0.641 (0.627; 0.656)		0.587 (0.574; 0.601)	
		60-65 y.o.	81209			0.573 (0.56; 0.586)		0.558 (0.545; 0.571)		0.558 (0.546; 0.571)		0.507 (0.496; 0.519)	
		65 y.o.	16110			0.468 (0.448; 0.488)		0.454 (0.434; 0.474)		0.454 (0.435; 0.474)		0.413 (0.395; 0.431)	
CMU-C		No[4]	655969					1		1		1	
		Yes	55834					0.696 (0.681; 0.711)		0.695 (0.681; 0.71)		0.669 (0.655; 0.684)	
GP PLA (deciles)		1[4]	18607							1		1	
		2	24385							0.966 (0.925; 1.01)		0.951 (0.909; 0.994)	
		3	26121							0.982 (0.941; 1.026)		0.97 (0.928; 1.013)	
		4	37307							1.004 (0.965; 1.046)		0.989 (0.95; 1.031)	
		5	49815							1.01 (0.971; 1.05)		0.991 (0.952; 1.03)	
		6	63615							1.033 (0.994; 1.073)		1.017 (0.978; 1.056)	
		7	98949							1.049 (1.011; 1.088)		1.031 (0.993; 1.069)	
		8	123460							1.086 (1.048; 1.126)		1.068 (1.03; 1.108)	
		9	127253							1.056 (1.018; 1.095)		1.046 (1.009; 1.086)	
		10	142291							1.03 (0.993; 1.069)		1.049 (1.011; 1.088)	
Official referring physician		No[4]	57596									1	
		Yes	654207									5.389 (5.227; 5.557)	

[4] Reference category

Mammography uptake multivariable logistic regression models (n= 187255): in 40-50 y.o. women (Mammography uptake = 20.77%)														
			N	Model 1	LogLik	Model 2	LogLik	Model 3	LogLik	Model 4	LogLik	Model 5	LogLik
			Tot= 187255	OR (95%CI)	-94934	OR (95%CI)	-94709	OR (95%CI)	-94508	OR (95%CI)	-94463	OR (95%CI)	-92837
Combined EDI and large urban/other	**EDI (deciles) in large urban areas**	1[S]	1284	1		1		1		1		1	
		2	2737	0.899 (0.857,0.944)		0.901 (0.859,0.946)		0.906 (0.863,0.951)		0.897 (0.855,0.942)		0.892 (0.849,0.937)	
		3	4550	0.845 (0.801,0.892)		0.847 (0.803,0.894)		0.855 (0.811,0.902)		0.843 (0.798,0.89)		0.839 (0.794,0.886)	
		4	5726	0.836 (0.791,0.884)		0.84 (0.794,0.888)		0.851 (0.805,0.9)		0.84 (0.794,0.888)		0.837 (0.791,0.885)	
		5	5472	0.745 (0.705,0.788)		0.748 (0.708,0.791)		0.761 (0.72,0.805)		0.751 (0.71,0.795)		0.753 (0.711,0.797)	
		6	8525	0.722 (0.682,0.764)		0.722 (0.682,0.765)		0.737 (0.696,0.78)		0.722 (0.682,0.766)		0.722 (0.681,0.766)	
		7	8283	0.688 (0.649,0.73)		0.69 (0.65,0.731)		0.705 (0.665,0.748)		0.699 (0.658,0.742)		0.71 (0.668,0.754)	
		8	8564	0.706 (0.665,0.75)		0.709 (0.668,0.753)		0.732 (0.689,0.777)		0.731 (0.687,0.778)		0.737 (0.693,0.784)	
		9	8629	0.639 (0.603,0.677)		0.64 (0.604,0.678)		0.67 (0.632,0.71)		0.665 (0.625,0.707)		0.678 (0.638,0.721)	
		10	6877	0.557 (0.528,0.587)		0.557 (0.528,0.587)		0.61 (0.578,0.644)		0.61 (0.575,0.647)		0.633 (0.596,0.671)	
	EDI (deciles) in other areas	1	16751	0.57 (0.492,0.66)		0.569 (0.491,0.66)		0.572 (0.494,0.663)		0.599 (0.516,0.694)		0.598 (0.515,0.694)	
		2	17342	0.616 (0.557,0.682)		0.615 (0.555,0.681)		0.619 (0.559,0.686)		0.634 (0.572,0.702)		0.635 (0.573,0.704)	
		3	12299	0.593 (0.546,0.644)		0.592 (0.545,0.643)		0.597 (0.549,0.648)		0.62 (0.571,0.674)		0.623 (0.573,0.678)	
		4	10802	0.596 (0.553,0.642)		0.595 (0.552,0.641)		0.602 (0.558,0.649)		0.613 (0.568,0.661)		0.614 (0.569,0.663)	
		5	11523	0.57 (0.528,0.616)		0.568 (0.526,0.614)		0.574 (0.531,0.62)		0.587 (0.543,0.635)		0.593 (0.548,0.641)	
		6	10898	0.613 (0.575,0.654)		0.612 (0.574,0.652)		0.621 (0.582,0.662)		0.624 (0.585,0.666)		0.633 (0.593,0.676)	
		7	10252	0.577 (0.54,0.616)		0.574 (0.538,0.613)		0.587 (0.55,0.627)		0.592 (0.554,0.633)		0.597 (0.558,0.638)	
		8	9432	0.53 (0.496,0.566)		0.528 (0.494,0.564)		0.543 (0.508,0.581)		0.55 (0.514,0.588)		0.555 (0.519,0.594)	
		9	11333	0.491 (0.459,0.525)		0.49 (0.458,0.524)		0.507 (0.474,0.543)		0.505 (0.471,0.541)		0.511 (0.477,0.548)	
		10	15976	0.452 (0.419,0.487)		0.45 (0.418,0.485)		0.476 (0.442,0.513)		0.479 (0.443,0.517)		0.486 (0.449,0.525)	
Age		40-45 y.o.[S]	92964			1		1		1		1	
		45-50 y.o.	94291			1.275 (1.247; 1.305)		1.27 (1.242; 1.299)		1.271 (1.242; 1.3)		1.258 (1.229; 1.286)	
CMU-C		No[S]	172456					1		1		1	
		Yes	14799					0.614 (0.584; 0.645)		0.613 (0.583; 0.645)		0.597 (0.567; 0.627)	
GP PLA (deciles)		1[S]	4959							1		1	
		2	6486							1.091 (0.99; 1.204)		1.078 (0.978; 1.19)	
		3	7123							1.064 (0.967; 1.172)		1.067 (0.969; 1.175)	
		4	10062							1.057 (0.966; 1.157)		1.044 (0.954; 1.144)	
		5	14074							1.159 (1.063; 1.264)		1.145 (1.05; 1.249)	
		6	17792							1.173 (1.078; 1.276)		1.158 (1.064; 1.261)	
		7	27034							1.217 (1.122; 1.321)		1.201 (1.107; 1.305)	
		8	33101							1.262 (1.165; 1.369)		1.247 (1.151; 1.354)	
		9	32681							1.193 (1.1; 1.295)		1.185 (1.092; 1.287)	
		10	33943							1.14 (1.05; 1.239)		1.161 (1.069; 1.262)	
Referring physician		No[S]	13378									1	
		Yes	173877									6.849 (6.275; 7.493)	

[S] Reference category

Mammography uptake multivariable logistic regression models (n= 154895): in > 74 y.o. women (Mammography uptake = 5.65%)													
			N	Model 1	LogLik	Model 2	LogLik	Model 3	LogLik	Model 4	LogLik	Model 5	LogLik
			Tot= 154895	OR (95%CI)	-33537	OR (95%CI)	-30948	OR (95%CI)	-30936	OR (95%CI)	-30890	OR (95%CI)	-30674
Combined EDI and large urban/other	EDI (deciles) in large urban areas	1[6]	939	1		1		1		1		1	
		2	2115	1.022 (0.904,1.154)		1.026 (0.906,1.162)		0.983 (0.95,1.018)		0.998 (0.88,1.131)		0.994 (0.877,1.127)	
		3	3983	0.968 (0.849,1.104)		1.009 (0.883,1.154)		0.971 (0.934,1.009)		0.978 (0.855,1.119)		0.973 (0.85,1.114)	
		4	6092	0.921 (0.803,1.055)		0.921 (0.802,1.058)		0.939 (0.902,0.976)		0.883 (0.769,1.015)		0.88 (0.765,1.011)	
		5	5757	0.893 (0.784,1.017)		0.956 (0.838,1.092)		0.897 (0.863,0.933)		0.898 (0.785,1.027)		0.892 (0.779,1.02)	
		6	9950	0.891 (0.784,1.013)		0.945 (0.829,1.077)		0.936 (0.901,0.973)		0.878 (0.769,1.002)		0.873 (0.765,0.997)	
		7	10334	0.896 (0.789,1.019)		0.973 (0.854,1.108)		0.858 (0.825,0.892)		0.88 (0.77,1.006)		0.879 (0.769,1.005)	
		8	10647	0.99 (0.873,1.123)		1.088 (0.957,1.238)		0.885 (0.85,0.922)		0.987 (0.865,1.127)		0.982 (0.86,1.121)	
		9	10974	0.926 (0.821,1.044)		1.029 (0.911,1.163)		0.855 (0.823,0.888)		0.89 (0.782,1.012)		0.886 (0.779,1.008)	
		10	9307	0.899 (0.802,1.007)		0.977 (0.87,1.097)		0.763 (0.737,0.79)		0.837 (0.74,0.948)		0.835 (0.738,0.946)	
	EDI (deciles) in other	1	7482	0.77 (0.572,1.039)		0.765 (0.565,1.035)		0.784 (0.719,0.855)		0.793 (0.584,1.075)		0.786 (0.579,1.066)	
		2	8759	0.78 (0.633,0.962)		0.767 (0.62,0.948)		0.845 (0.795,0.897)		0.791 (0.64,0.979)		0.782 (0.632,0.968)	
		3	6862	0.701 (0.592,0.831)		0.708 (0.596,0.841)		0.817 (0.778,0.858)		0.742 (0.623,0.882)		0.733 (0.616,0.872)	
		4	6193	0.645 (0.555,0.75)		0.671 (0.576,0.782)		0.833 (0.797,0.871)		0.662 (0.568,0.772)		0.659 (0.565,0.769)	
		5	7566	0.539 (0.458,0.634)		0.552 (0.468,0.65)		0.78 (0.746,0.817)		0.55 (0.466,0.649)		0.547 (0.463,0.646)	
		6	8023	0.696 (0.612,0.791)		0.726 (0.637,0.827)		0.838 (0.805,0.871)		0.692 (0.607,0.79)		0.686 (0.601,0.783)	
		7	8076	0.65 (0.571,0.739)		0.696 (0.61,0.794)		0.824 (0.792,0.857)		0.657 (0.575,0.751)		0.65 (0.569,0.743)	
		8	7774	0.728 (0.642,0.825)		0.774 (0.681,0.878)		0.833 (0.802,0.866)		0.727 (0.638,0.828)		0.717 (0.629,0.816)	
		9	10269	0.706 (0.623,0.8)		0.776 (0.683,0.881)		0.762 (0.733,0.792)		0.728 (0.64,0.829)		0.72 (0.632,0.82)	
		10	13793	0.693 (0.608,0.79)		0.757 (0.663,0.864)		0.718 (0.688,0.75)		0.675 (0.588,0.775)		0.666 (0.58,0.765)	
Age		75-80 y.o.[6]	50815			1		1		1		1	
		80-85 y.o.	48148			0.387 (0.368; 0.407)		0.387 (0.368; 0.407)		0.386 (0.367; 0.406)		0.385 (0.366; 0.405)	
		85-90 y.o.	34698			0.152 (0.14; 0.165)		0.152 (0.14; 0.165)		0.151 (0.139; 0.164)		0.151 (0.139; 0.164)	
		90-95 y.o.	16602			0.067 (0.057; 0.079)		0.067 (0.057; 0.079)		0.067 (0.056; 0.079)		0.067 (0.056; 0.079)	
		95-100 y.o.	4632			0.024 (0.013; 0.038)		0.024 (0.013; 0.038)		0.023 (0.013; 0.038)		0.025 (0.014; 0.04)	
CMU-C		No[6]	153807					1		1		1	
		Yes	1088					0.443 (0.298; 0.63		0.443 (0.298; 0.63)		0.439 (0.295; 0.625)	
GP PLA (deciles)		1[6]	4675							1		1	
		2	5726							1.14 (0.94; 1.386)		1.138 (0.938; 1.383)	
		3	5537							1.037 (0.851; 1.265)		1.035 (0.85; 1.263)	
		4	7717							1.091 (0.909; 1.314)		1.085 (0.904; 1.306)	
		5	9569							1.171 (0.983; 1.399)		1.17 (0.983; 1.399)	
		6	11747							1.25 (1.056; 1.486)		1.25 (1.055; 1.486)	
		7	18800							1.316 (1.12; 1.554)		1.312 (1.117; 1.549)	
		8	25658							1.441 (1.231; 1.694)		1.44 (1.231; 1.695)	
		9	30207							1.398 (1.195; 1.644)		1.403 (1.199; 1.65)	
		10	35259							1.546 (1.322; 1.818)		1.555 (1.329; 1.829)	
Referring physician		No[6]	5992									1	
		Yes	148903									8.938 (6.66; 12.37)	

[6] Reference category

Pap smear uptake multivariable logistic regression models (n= 63068) in 20-25 y.o. women (Pap smear uptake = 20.58 %)														
			N	**Model 1**	LogLik	**Model 2**	LogLik	**Model 3**	LogLik	**Model 4**	LogLik	**Model 5**	LogLik
			Tot= 63068	OR (95%CI)	-31988	OR (95%CI)	-31676	OR (95%CI)	-31675	OR (95%CI)	-31670	OR (95%CI)	-30989
Combined EDI and large urban/other	**EDI** (deciles) **in large urban areas**	1[7]	272	1		1		1		1		1	
		2	600	0.958 (0.864; 1.062)		0.951 (0.858; 1.056)		0.952 (0.859; 1.057)		0.956 (0.861; 1.062)		0.941 (0.846; 1.046)	
		3	1047	0.992 (0.888; 1.108)		0.985 (0.881; 1.101)		0.987 (0.882; 1.103)		0.987 (0.882; 1.105)		0.975 (0.87; 1.093)	
		4	1451	1.024 (0.914; 1.146)		1.021 (0.911; 1.143)		1.022 (0.913; 1.145)		1.029 (0.918; 1.154)		1.021 (0.91; 1.146)	
		5	1412	0.915 (0.823; 1.017)		0.905 (0.813; 1.007)		0.907 (0.815; 1.009)		0.922 (0.827; 1.028)		0.921 (0.825; 1.028)	
		6	2197	0.896 (0.803; 0.999)		0.889 (0.797; 0.992)		0.892 (0.799; 0.995)		0.903 (0.808; 1.009)		0.895 (0.8; 1.002)	
		7	2336	0.92 (0.828; 1.023)		0.901 (0.81; 1.002)		0.903 (0.812; 1.005)		0.923 (0.827; 1.03)		0.94 (0.841; 1.05)	
		8	2376	0.917 (0.824; 1.02)		0.895 (0.804; 0.997)		0.898 (0.806; 1)		0.925 (0.828; 1.033)		0.938 (0.838; 1.049)	
		9	2575	0.824 (0.746; 0.909)		0.801 (0.726; 0.885)		0.804 (0.728; 0.889)		0.834 (0.751; 0.927)		0.858 (0.771; 0.954)	
		10	2484	0.735 (0.67; 0.808)		0.733 (0.667; 0.805)		0.739 (0.672; 0.812)		0.772 (0.697; 0.856)		0.802 (0.722; 0.89)	
	EDI (deciles) **in other areas**	1	3700	0.696 (0.498; 0.953)		0.701 (0.501; 0.961)		0.701 (0.501; 0.962)		0.701 (0.5; 0.962)		0.729 (0.519; 1.005)	
		2	4599	0.895 (0.723; 1.101)		0.903 (0.729; 1.112)		0.903 (0.729; 1.113)		0.904 (0.729; 1.114)		0.902 (0.726; 1.114)	
		3	3387	0.938 (0.794; 1.105)		0.956 (0.809; 1.127)		0.957 (0.809; 1.128)		0.964 (0.814; 1.138)		0.963 (0.812; 1.139)	
		4	3098	0.779 (0.669; 0.906)		0.78 (0.669; 0.908)		0.781 (0.67; 0.909)		0.788 (0.675; 0.917)		0.784 (0.671; 0.914)	
		5	4188	0.846 (0.727; 0.983)		0.852 (0.731; 0.99)		0.853 (0.732; 0.992)		0.859 (0.736; 0.999)		0.849 (0.727; 0.989)	
		6	3814	0.839 (0.737; 0.955)		0.849 (0.745; 0.966)		0.85 (0.746; 0.967)		0.858 (0.752; 0.977)		0.849 (0.744; 0.969)	
		7	4205	0.835 (0.735; 0.948)		0.838 (0.737; 0.951)		0.84 (0.739; 0.954)		0.855 (0.751; 0.972)		0.837 (0.735; 0.954)	
		8	4074	0.77 (0.677; 0.875)		0.776 (0.682; 0.882)		0.778 (0.683; 0.885)		0.789 (0.692; 0.899)		0.78 (0.683; 0.89)	
		9	6237	0.797 (0.704; 0.902)		0.809 (0.713; 0.916)		0.812 (0.716; 0.919)		0.823 (0.725; 0.934)		0.826 (0.726; 0.939)	
		10	9016	0.655 (0.574; 0.746)		0.661 (0.579; 0.754)		0.665 (0.582; 0.758)		0.688 (0.6; 0.787)		0.701 (0.61; 0.803)	
Age		20-21y.o[7]	9827			1		1		1		1	
		21-22 y.o.	11080			1.234 (1.144; 1.33)		1.233 (1.144; 1.33)		1.234 (1.144; 1.33)		1.205 (1.117; 1.3)	
		22-23 y.o.	12631			1.516 (1.411; 1.628)		1.514 (1.41; 1.626)		1.516 (1.412; 1.628)		1.435 (1.335; 1.543)	
		23-24 y.o.	14064			1.709 (1.595; 1.832)		1.707 (1.593; 1.83)		1.711 (1.597; 1.834)		1.576 (1.47; 1.691)	
		24-25 y.o.	15466			2.102 (1.966; 2.249)		2.099 (1.963; 2.246)		2.104 (1.967; 2.25)		1.912 (1.787; 2.047)	
CMU-C		No[7]	54768					1		1		1	
		Yes	8300					0.968 (0.911; 1.028)		0.969 (0.912; 1.029)		0.899 (0.845; 0.955)	
GP PLA (deciles)		1[7]	1167							1		1	
		2	1569							1.057 (0.873; 1.281)		1.033 (0.851; 1.254)	
		3	1626							1.09 (0.903; 1.318)		1.069 (0.884; 1.295)	
		4	2498							1.096 (0.92; 1.307)		1.075 (0.902; 1.285)	
		5	3594							1.07 (0.906; 1.268)		1.055 (0.891; 1.252)	
		6	4813							1.026 (0.872; 1.21)		1.018 (0.864; 1.203)	
		7	7959							1.055 (0.902; 1.238)		1.039 (0.887; 1.222)	
		8	10982							1.074 (0.92; 1.257)		1.054 (0.902; 1.236)	
		9	12533							1.021 (0.875; 1.196)		1.011 (0.865; 1.186)	
		10	16327							0.986 (0.845; 1.155)		1.004 (0.859; 1.178)	
Referring physician		No[7]	13716									1	
		Yes	49352									2.859 (2.69; 3.042)	

[7] Reference category

Pap smear uptake multivariable logistic regression models (n= 252156) in > 65 y.o. women (Pap smear uptake = 5.69%)

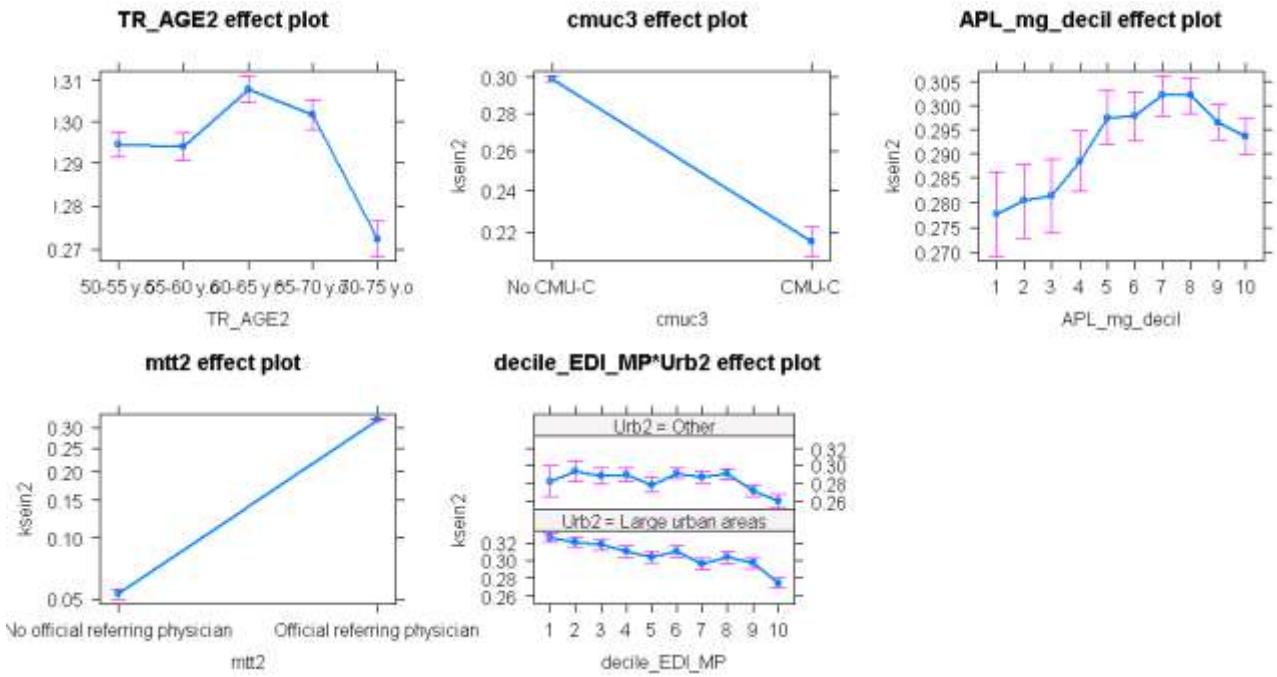
			N	Model 1	LogLik	Model 2	LogLik	Model 3	LogLik	Model 4	LogLik	Model 5	LogLik
			Tot= 252156	OR (95%CI)	-54676	OR (95%CI)	-48204	OR (95%CI)	-48196	OR (95%CI)	-48125	OR (95%CI)	-47675
Combined EDI and large urban/other areas	**EDI** (deciles) **in large urban areas**	1[a]	1669	1		1		1		1		1	
		2	3720	0.875 (0.805,0.951)		0.904 (0.83,0.985)		0.905 (0.83,0.985)		0.874 (0.801,0.953)		0.865 (0.793,0.944)	
		3	6672	0.822 (0.75,0.901)		0.903 (0.821,0.992)		0.903 (0.821,0.992)		0.874 (0.795,0.961)		0.866 (0.787,0.953)	
		4	9800	0.786 (0.714,0.865)		0.859 (0.779,0.948)		0.86 (0.78,0.949)		0.825 (0.748,0.911)		0.817 (0.74,0.902)	
		5	9294	0.743 (0.677,0.815)		0.858 (0.78,0.944)		0.859 (0.782,0.945)		0.809 (0.735,0.891)		0.805 (0.731,0.887)	
		6	15807	0.641 (0.584,0.705)		0.738 (0.669,0.813)		0.738 (0.67,0.813)		0.687 (0.622,0.758)		0.679 (0.615,0.749)	
		7	16336	0.69 (0.628,0.757)		0.833 (0.757,0.917)		0.834 (0.757,0.918)		0.763 (0.691,0.842)		0.764 (0.692,0.843)	
		8	16801	0.796 (0.727,0.872)		0.982 (0.894,1.079)		0.984 (0.895,1.081)		0.898 (0.815,0.99)		0.895 (0.812,0.987)	
		9	17022	0.685 (0.628,0.748)		0.855 (0.781,0.936)		0.858 (0.784,0.94)		0.748 (0.68,0.823)		0.745 (0.677,0.82)	
		10	14130	0.647 (0.596,0.702)		0.789 (0.725,0.858)		0.795 (0.73,0.865)		0.68 (0.621,0.745)		0.678 (0.619,0.743)	
	EDI (deciles) **in other areas**	1	14042	0.641 (0.517,0.795)		0.669 (0.537,0.834)		0.668 (0.536,0.833)		0.693 (0.555,0.865)		0.687 (0.55,0.858)	
		2	15838	0.571 (0.488,0.669)		0.6 (0.511,0.705)		0.6 (0.511,0.704)		0.616 (0.524,0.724)		0.607 (0.516,0.714)	
		3	11781	0.556 (0.49,0.63)		0.616 (0.542,0.7)		0.616 (0.542,0.7)		0.635 (0.558,0.723)		0.628 (0.551,0.715)	
		4	10633	0.522 (0.467,0.583)		0.61 (0.545,0.683)		0.61 (0.545,0.683)		0.603 (0.538,0.676)		0.596 (0.532,0.668)	
		5	12461	0.456 (0.405,0.513)		0.524 (0.464,0.591)		0.524 (0.464,0.591)		0.526 (0.466,0.594)		0.519 (0.459,0.586)	
		6	13160	0.5 (0.454,0.55)		0.598 (0.542,0.659)		0.598 (0.542,0.659)		0.577 (0.522,0.637)		0.569 (0.515,0.629)	
		7	12897	0.497 (0.452,0.547)		0.599 (0.544,0.66)		0.6 (0.544,0.661)		0.572 (0.518,0.631)		0.564 (0.511,0.623)	
		8	12297	0.508 (0.463,0.558)		0.612 (0.556,0.673)		0.612 (0.556,0.674)		0.579 (0.525,0.639)		0.57 (0.516,0.629)	
		9	15991	0.436 (0.396,0.481)		0.535 (0.484,0.591)		0.535 (0.485,0.591)		0.503 (0.454,0.556)		0.495 (0.447,0.548)	
		10	21805	0.461 (0.416,0.51)		0.587 (0.529,0.651)		0.589 (0.53,0.653)		0.528 (0.474,0.588)		0.519 (0.466,0.578)	
Age		65-70 y.o.[a]	48684			1		1		1		1	
		70-75 y.o.	48577			0.583 (0.56; 0.607)		0.582 (0.559; 0.606)		0.581 (0.558; 0.605)		0.578 (0.555; 0.601)	
		75-80 y.o.	50815			0.252 (0.24; 0.266)		0.252 (0.239; 0.265)		0.251 (0.238; 0.264)		0.247 (0.234; 0.26)	
		80-85 y.o.	48148			0.094 (0.087; 0.102)		0.094 (0.087; 0.101)		0.093 (0.086; 0.101)		0.092 (0.085; 0.099)	
		85-90 y.o.	34698			0.03 (0.026; 0.035)		0.03 (0.026; 0.035)		0.03 (0.026; 0.035)		0.029 (0.025; 0.034)	
		90-95 y.o.	16602			0.013 (0.01; 0.018)		0.013 (0.01; 0.018)		0.013 (0.009; 0.018)		0.013 (0.009; 0.018)	
		95-100 y.o.	4632			0.005 (0.002; 0.012)		0.005 (0.002; 0.012)		0.005 (0.002; 0.012)		0.005 (0.002; 0.012)	
CMU-C		No[a]	249945					1		1		1	
		Yes	2211					0.68 (0.558; 0.821)		0.676 (0.555; 0.816)		0.67 (0.55; 0.809)	
GP PLA (deciles)		1[a]	7805							1		1	
		2	9343							0.85 (0.731; 0.989)		0.842 (0.724; 0.98)	
		3	9254							0.885 (0.763; 1.028)		0.886 (0.763; 1.029)	
		4	12955							1.004 (0.877; 1.151)		0.995 (0.869; 1.141)	
		5	16421							1.054 (0.927; 1.202)		1.053 (0.926; 1.201)	
		6	19914							1.088 (0.96; 1.237)		1.08 (0.952; 1.227)	
		7	31912							1.147 (1.017; 1.296)		1.14 (1.011; 1.289)	
		8	42273							1.223 (1.087; 1.379)		1.214 (1.08; 1.37)	
		9	47761							1.282 (1.14; 1.446)		1.282 (1.14; 1.446)	
		10	54518							1.319 (1.173; 1.488)		1.327 (1.179; 1.497)	
Referring physician		No[a]	10487									1	
		Yes	241669									9.629 (7.764; 12.133)	

[a] Reference category

Model with the interaction term
Mammography uptake within the recommended age group

```
Terms added sequentially (first to last)


                    Df Deviance Resid. Df Resid. Dev  Pr(>Chi)
NULL                                365946     451746
decile_EDI_MP        9    596.5    365937     451149 < 2.2e-16 ***
Urb2                 1    176.5    365936     450973 < 2.2e-16 ***
TR_AGE2              4    184.5    365932     450788 < 2.2e-16 ***
cmuc3                1    430.7    365931     450358 < 2.2e-16 ***
APL_mg_decil         9    100.1    365922     450257 < 2.2e-16 ***
mtt2                 1   8451.2    365921     441806 < 2.2e-16 ***
decile_EDI_MP:Urb2   9     23.7    365912     441783  0.004837 **
```



Model with the interaction term
Pap smear uptake within the recommended age group

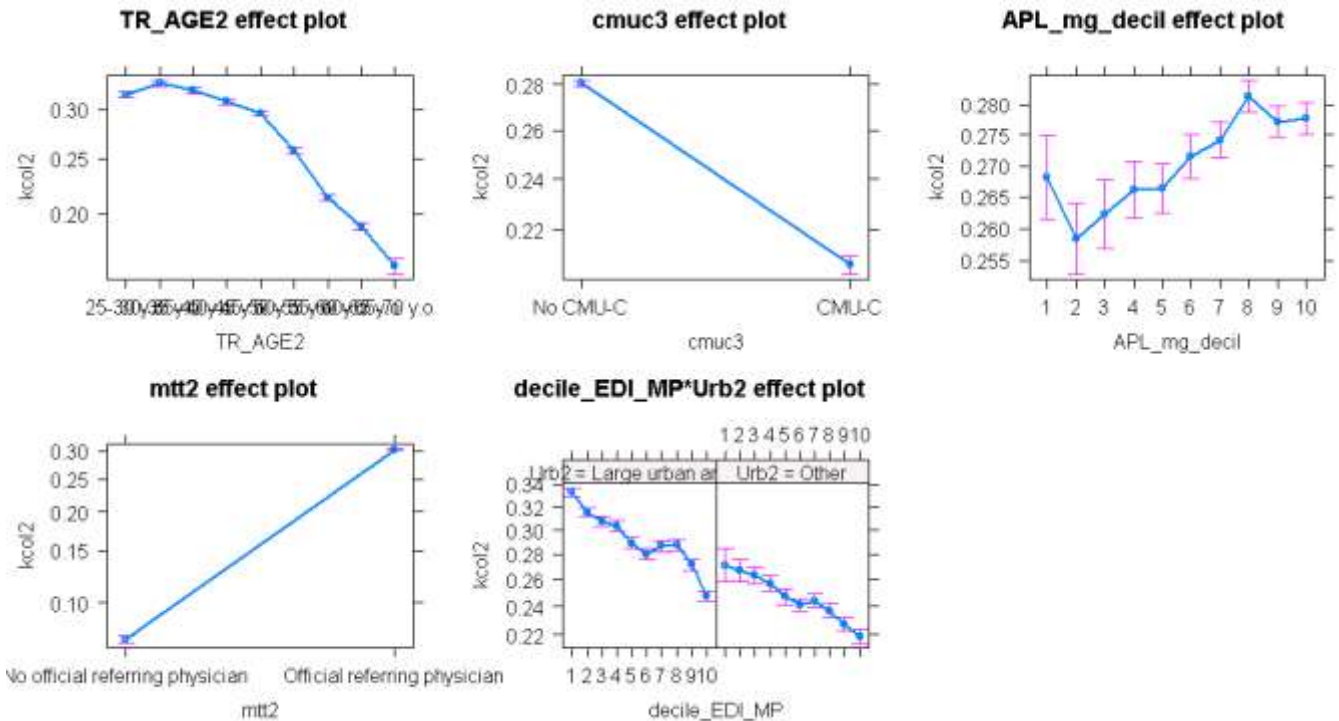
```
> regInter2 <- glm(kcol2~decile_EDI_MP*Urb2
+                  +TR_AGE2
+                  +cmuc3
+                  +APL_mg_decil
+                  +mtt2
+                  , data=BFR, family = "binomial")
> ##Test amélioration du modèle avec ajout interaction
> anova(regInter2, test = "Chisq")
Analysis of Deviance Table

Model: binomial, link: logit

Response: kcol2

Terms added sequentially (first to last)


                  Df Deviance Resid. Df Resid. Dev  Pr(>Chi)
NULL                                711802     854795
decile_EDI_MP      9   3211.7    711793     851583 < 2.2e-16 ***
Urb2               1   2059.1    711792     849524 < 2.2e-16 ***
TR_AGE2            8   7545.6    711784     841979 < 2.2e-16 ***
cmuc3              1   1206.8    711783     840772 < 2.2e-16 ***
APL_mg_decil       9    121.1    711774     840651 < 2.2e-16 ***
mtt2               1  17512.2    711773     823139 < 2.2e-16 ***
decile_EDI_MP:Urb2 9     24.2    711764     823114  0.003995 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```



Model with the interaction term EDI:Urb

	Mammography uptake				Pap smear uptake			
term	OR	conf.low	conf.high	p.value	OR	conf.low	conf.high	p.value
(Intercept)	0.060	0.055	0.065	0	0.130	0.124	0.137	0
EDI 2	0.976	0.942	1.011	0.17900	0.922	0.899	0.945	8.98E-11
EDI 3	0.962	0.925	1.000	0.04902	0.889	0.865	0.913	1.30E-17
EDI 4	0.927	0.891	0.965	0.00021	0.873	0.849	0.898	1.54E-21
EDI 5	0.897	0.862	0.933	7.26E-08	0.816	0.794	0.839	9.50E-48
EDI 6	0.927	0.891	0.964	0.00017	0.781	0.759	0.803	2.54E-67
EDI 7	0.864	0.830	0.900	2.40E-12	0.805	0.782	0.828	1.74E-50
EDI 8	0.895	0.858	0.933	2.07E-07	0.810	0.787	0.834	1.26E-45
EDI 9	0.867	0.833	0.903	4.82E-12	0.748	0.727	0.769	3.44E-90
EDI 10	0.777	0.748	0.808	1.19E-37	0.660	0.642	0.679	1.51E-193
Other areas	0.808	0.740	0.882	1.96E-06	0.747	0.699	0.799	1.60E-17
30-35 y.o	-	-	-	-	1.060	1.038	1.082	5.00E-08
35-40 y.o	-	-	-	-	1.021	1.000	1.043	0.0477679
40-45 y.o	-	-	-	-	0.963	0.944	0.984	0.000401
45-50 y.o	-	-	-	-	0.906	0.888	0.925	9.18E-21
50-55 y.o	-	-	-	-	0.749	0.733	0.765	3.43E-155
55-60 y.o	0.997	0.977	1.018	0.79523719	0.587	0.574	0.601	0
60-65 y.o	1.066	1.044	1.088	2.27E-09	0.507	0.496	0.519	0
65-70 y.o	1.035	1.012	1.058	0.00232007	0.413	0.395	0.431	0
70-75 y.o	0.897	0.875	0.919	4.31E-18	-	-	-	-
CMU-C	0.644	0.618	0.671	2.56E-97	0.669	0.655	0.684	2.25E-299
APL2	1.013	0.958	1.072	0.64041656	0.951	0.909	0.994	0.026
APL3	1.018	0.964	1.076	0.51461532	0.970	0.928	1.013	0.170
APL4	1.054	1.002	1.110	0.0430028	0.989	0.950	1.031	0.610
APL5	1.102	1.048	1.158	0.00012914	0.991	0.952	1.030	0.635
APL6	1.103	1.051	1.158	6.57E-05	1.017	0.978	1.056	0.401
APL7	1.126	1.075	1.180	4.90E-07	1.031	0.993	1.069	0.112
APL8	1.126	1.076	1.179	3.03E-07	1.068	1.030	1.108	0.000
APL9	1.096	1.047	1.148	8.04E-05	1.046	1.009	1.086	0.015
APL10	1.081	1.032	1.132	0.000944	1.049	1.011	1.088	0.012
Referring physician	8.450	7.946	8.996	0	5.389	5.227	5.557	0.000
EDI 2:Other areas	1.084	0.974	1.207	0.139	1.062	0.978	1.153	0.151
EDI 3:Other areas	1.073	0.969	1.189	0.176	1.078	0.997	1.166	0.059
EDI 4:Other areas	1.121	1.015	1.240	0.025	1.062	0.984	1.147	0.122
EDI 5:Other areas	1.095	0.991	1.211	0.076	1.079	1.000	1.166	0.051
EDI 6:Other areas	1.129	1.025	1.245	0.014	1.091	1.013	1.176	0.022
EDI 7:Other areas	1.187	1.076	1.309	0.001	1.077	0.999	1.161	0.052
EDI 8:Other areas	1.164	1.056	1.285	0.002	1.028	0.954	1.109	0.467
EDI 9:Other areas	1.095	0.993	1.207	0.070	1.055	0.979	1.137	0.159
EDI 10:Other areas	1.155	1.048	1.275	0.004	1.139	1.056	1.228	0.001

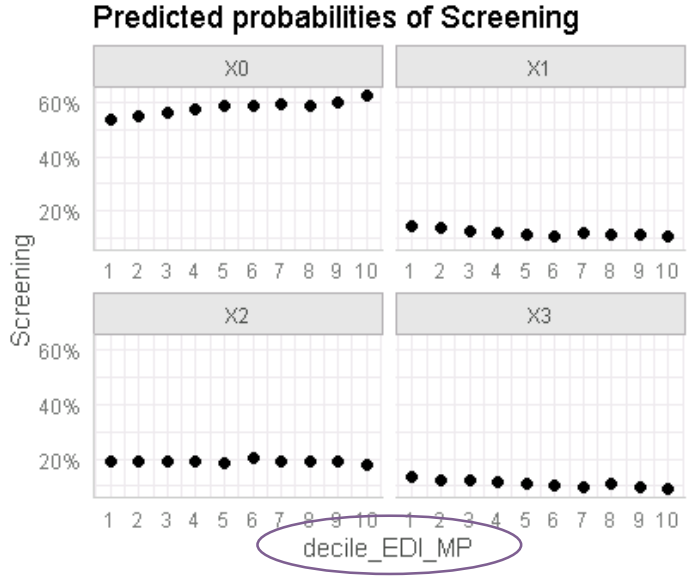
Multinomial analysis

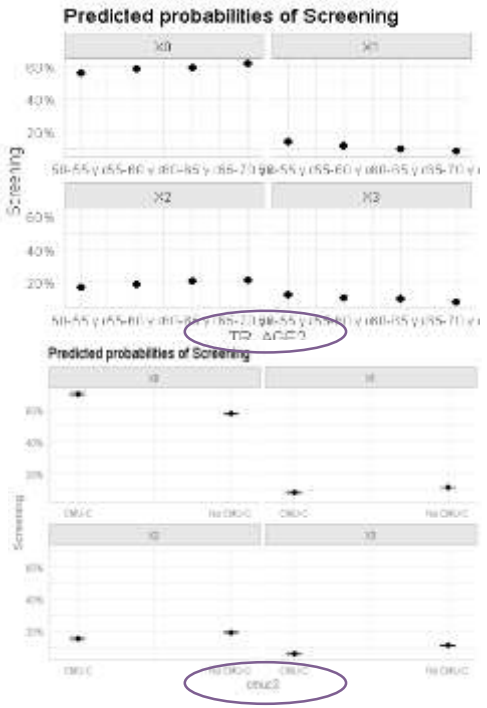
Among 50-65 women: which women are doing no screening test? only pap smear? only Mammography? both?

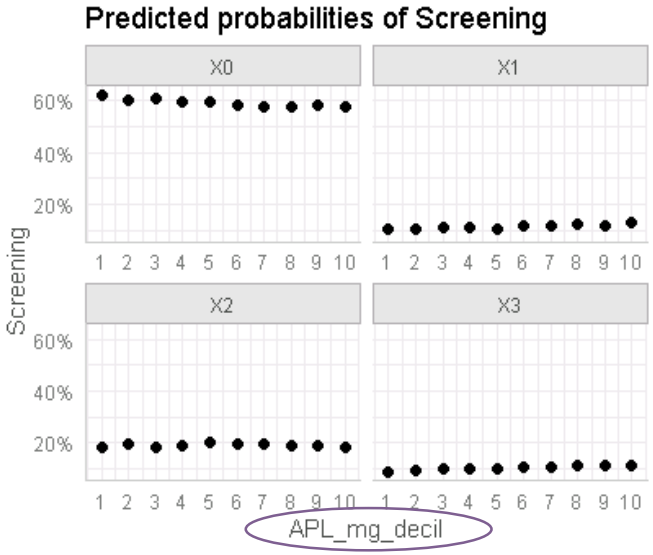
Screening	0	1	2	3
Frequency (N/%)	153419 (57.1%)	32172 (12%)	52699 (19.6%)	30396 (11.3%)

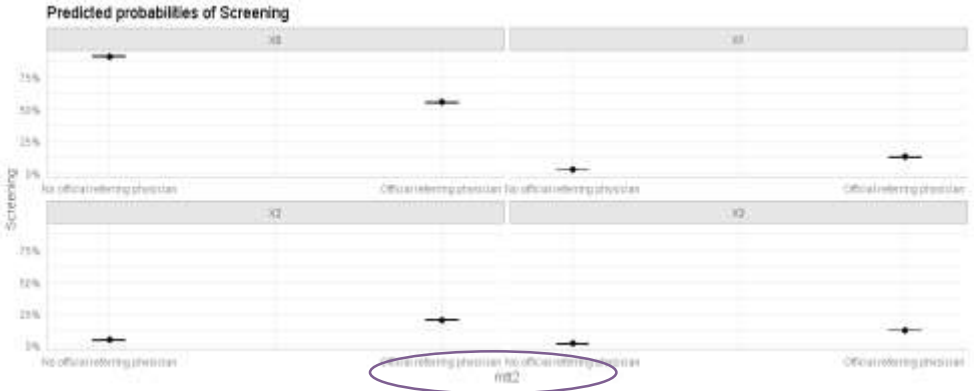
← New variable:

- 0= no screening test
- 1= pap smear
- 2= mammography
- 3= both









Gyn/radio selon degrés d’urbanisation