ALLERGY

PARENTAL ALLERGY HISTORY AT FARMS

26.07.2022

A recent paper on the bias of farming studies missed the healthy worker effect although this is being the most likely explanation.

So let's have a more detailed look at farm parents. It can be drilled down to the question if parents are also "protected" or it is more likely that some affected parents just moved away.

Here are 13 studies that included information about farm parents.

Table 1. Characteristics of the study population according to farming as parental occupation

	Total study population $N = 1620$ (n,%)	Parental occupation		P value (χ^2 test)
		Farming $N = 307$ (n,%)	Non-Farming $N = 1313$ (n,%)	
Sex				
Boys	844/52.1	161/52.4	683/52.0	n.s.
Girls	776/47.9	146/47.6	630/48.0	
Age group				
6–7	555/34.3	108/35.3	447/34.0	
9–12	481/29.7	83/27.1	398/30.3	n.s.
13–15	583/36.0	115/37.6	468/35.6	
(Missing: 1)				
Parental education				
Low	135/8.3	66/21.5	69/5.3	
Medium	952/58.8	201/65.5	751/57.2	<0.001
High	469/29.0	33/10.7	436/33.2	
(Missing: 64)				
Number of siblings				
None	97/6.0	9/2.9	88/6.7	
1	677/41.8	55/17.9	622/47.4	
2	508/31.4	94/30.6	414/31.5	<0.001
3+	257/15.9	108/35.2	149/11.3	
(Missing: 81)				
Mother smoking	375/23.2	55/18.0	320/24.4	0.015
(Missing: 12)				
Father smoking	473/29.2	88/28.7	385/29.3	n.s.
(Missing: 12)				
Furred pets	1041/64.3	268/87.3	773/58.9	0.001
Pets in bedroom	430/26.5	56/18.2	374/28.5	0.001
Indoor humidity	353/21.8	87/28.3	266/20.3	0.02
Heating				
Central	1284/79.3	206/67.1	1078/82.1	
Single space gas/oil	30/1.9	6/2.0	24/1.8	
Electric	38/2.4	7/2.3	31/2.4	<0.001
Wood/coal	187/11.5	72/23.5	115/8.8	
(Missing: 81)				
Family history of asthma	265/16.4	38/12.4	227/17.3	0.05
(Missing: 27)				
Family history of hay fever	425/26.2	39/12.7	386/29.4	0.001
Family history of eczema	415/25.6	65/21.2	350/26.7	0.05

Braun-Fahrländer 1999

Table 3. Differences in living conditions between children of farming and non-farming parents†

Characteristic	Non-farming ($N = 8466$) % (n/N)	Farming ($N = 1181$) % (n/N)
Family history of atopic disease‡	46.0 (3897/8466)	35.4*** (418/1181)
Parental education		
Low	43.2 (3408/7886)	55.5*** (604/1089)
Medium	36.6 (2887/7886)	34.5 (376/1089)
High	20.2 (1591/7886)	10.0*** (109/1089)
Number of older siblings		
None	45.6 (3800/8326)	37.4*** (438/1170)
One	38.5 (3202/8326)	34.1** (399/1170)
Two or more	15.9 (1324/8326)	28.5*** (333/1170)
Wood and coal as energy source for heating and cooking	12.4 (698/5631)	75.6*** (541/716)
Indoor dampness	7.0 (588/8377)	8.7* (102/1173)
Antibiotic treatment in the first 3 years		
≤ 2 times	63.2 (5127/8108)	67.2** (751/1118)
3–5 times	26.3 (2129/8108)	24.5 (274/1118)
≥ 6 times	10.5 (852/8108)	8.3* (93/1118)
Homeopathic treatment for fever	7.0 (583/8343)	5.0** (58/1163)
Consumption of whole milk		
< once/week	32.8 (2563/7816)	16.7*** (189/1132)
1–2x/week	13.5 (1055/7816)	12.1 (137/1132)
≥ 3/week	53.7 (4198/7816)	71.2*** (806/1132)

[Ehrenstein 2000]

Table 1. Differences between urban and rural children, according to current place of residence

		Urban	Rural	*P*-value
n		559	438	–
Male – *n* (%)		256 (45.8%)	200 (45.7%)	0.966
Age – median (range)		13 (11–19)	13 (11–17)	0.025
Urban (aged < 5 yrs)		509 (91.4%)	30 (6.9%)	< 0.001
Mother's age – median (range)		24 (14–43)	24 (14–45)	0.541
Father's age – median (range)		29 (15–61)	32 (18–55)	< 0.001
Parental allergy		151 (27.3%)	112 (26.1%)	0.687
Mother's years of pre-university schooling – median (range)		12 (3–19)	7 (0–18)	< 0.001
Siblings – *n* (%)	0/1	350 (62.6%)	142 (32.4%)	< 0.001
	2	153 (27.4%)	145 (33.1%)	
	3 +	56 (10.0%)	151 (34.5%)	
High levels of crowding (> = 2 people/room)	187 (34.6%)	170 (40.5%)	0.063	
Farming parents (aged < 5 yrs)	Full-time – *n* (%)	18 (3.2%)	254 (58.7%)	< 0.001
	Part-time – *n* (%)	180 (32.3%)	125 (28.9%)	
Farm animal contact (aged < 5 yrs)	Never	299 (54.1%)	132 (30.6%)	< 0.001
	Sometimes	170 (30.7%)	119 (27.6%)	
	Daily/ > 1 per week	84 (15.2%)	181 (41.9%)	
Farm milk consumption (aged < 5 years)	Never	425 (76.3%)	235 (54.5%)	< 0.001
	Sometimes	99 (17.8%)	119 (27.6%)	
	Daily	77 (17.9%)	33 (5.9%)	
Skin prick test participants				
n		512	418	
Atopy		100 (19.6%)	40 (9.6%)	< 0.001
SPT +: house dust mite		72 (14.1%)	18 (4.3%)	< 0.001
SPT +: cat		16 (3.1%)	2 (0.5%)	0.004
SPT +: grass*		48 (9.4%)	24 (5.7%)	0.038
Parietaria		26 (5.1%)	4 (1.0%)	< 0.001
Olive		29 (5.7%)	12 (2.9%)	0.038
Goat		4 (0.8%)	2 (0.5%)	0.696
Alternaria		1 (0.2%)	1 (0.2%)	1.000

[Barnes 2001]

Table 1. Respondent characteristics by current farm or nonfarm abode

	Current farm (n = 95) n (%)	Current nonfarm (n = 198) n (%)	P value
Gender			
Male	43 (45)	97 (49)	0.55
Female	52 (55)	101 (51)	
Ethnicity*			
Maori	13 (14)	49 (25)	0.03
European	88 (93)	173 (87)	0.18
Mother's post-primary education			
< 4 years	20 (21)	75 (40)	< 0.0001
4–6 years	43 (45)	84 (45)	
7+ years	32 (34)	29 (15)	
Family history of allergic disease	72 (76)	125 (63)	0.03
Family size			
0–1 siblings	30 (32)	79 (40)	0.19
2+ siblings	65 (68)	119 (60)	
Infections			
Measles infection ever	19 (20)	31 (16)	0.36
Whooping cough infection ever	7 (7)	11 (6)	0.56
First-year-of-life exposures			
Cats inside or outside	73 (77)	150 (76)	0.84
Dogs inside or outside	67 (71)	118 (60)	0.07
Regular contact with poultry	19 (20)	17 (9)	0.005
Regular contact with pigs	14 (15)	15 (8)	0.06
Antibiotics in the first year	54 (57)	127 (64)	0.23
Coal or wood fires	87 (92)	164 (83)	0.05
Mother smoked	23 (24)	85 (43)	0.002
Diet under 2 years			
Yoghurt once or more a week	72 (76)	153 (77)	0.78
Pasteurized milk once or more a day	53 (56)	139 (70)	0.02
Unpasteurized milk ever	22 (23)	16 (8)	0.0003
Cheese once or more a week	75 (79)	125 (63)	0.007
Current exposures			
Cats inside or outside	79 (83)	155 (78)	0.33
Dogs inside or outside	85 (89)	129 (65)	< 0.0001
Regular contact with poultry	27 (28)	18 (9)	< 0.0001
Regular contact with pigs	14 (15)	8 (4)	0.001
Coal or wood fires	94 (99)	179 (90)	0.007
Mother smokes	20 (21)	76 (38)	0.003

Wickens 2002

TABLE I. Demographic profile of respondents to the initial questionnaire

	Control subjects' prevalence, % (n)	Laborers' children's prevalence, % (n)	Farm children's prevalence, % (n)	χ^2 Test for heterogeneity between farming groups
Pets inside the house				
Currently				
Any household pets	70.4 (2748)	72.6 (199)	63.2 (330)	$P = .002$
Dog	39.4 (1539)	46.0 (126)	46.2 (241)	$P = .002$
Cat	37.2 (1451)	40.5 (111)	32.4 (169)	$P = .04$
First year of life				
Any household pets	59.4 (2117)	68.2 (165)	56.2 (264)	$P = .008$
Dog	35.6 (1268)	41.7 (101)	40.8 (192)	$P = .02$
Cat	33.8 (1205)	38.8 (94)	28.5 (134)	$P = .01$
Contact with animals outside the house				
Currently				
Any animal contact outside the house	71.8 (2831)	89.7 (252)	96.8 (518)	$P < .001$
Dog	51.1 (2017)	69.0 (194)	85.4 (457)	$P < .001$
Cat	37.3 (1471)	50.5 (142)	62.1 (332)	$P < .001$
Horse or pony	17.0 (670)	28.5 (80)	35.3 (189)	$P < .001$
Farm animals	12.8 (505)	50.9 (143)	89.5 (479)	$P < .001$
First year of life				
Any animal contact outside the house	58.6 (2030)	80.9 (203)	87.9 (442)	$P < .001$
Dog	44.3 (1535)	64.9 (163)	74.2 (373)	$P < .001$
Cat	31.3 (1085)	44.6 (112)	49.7 (250)	$P < .001$
Horse or pony	9.3 (323)	19.5 (49)	24.1 (121)	$P < .001$
Farm animals	11.8 (408)	41.8 (105)	67.3 (339)	$P < .001$
Frequency with which child plays in a barn or stable				
More than once per day	1.0 (39)	3.6 (10)	7.7 (41)	$P < .001$
Once per day	1.6 (61)	5.4 (15)	11.1 (59)	
1-6 times per week	6.5 (252)	18.0 (50)	38.9 (207)	
Less than once per week	33.4 (1302)	44.6 (124)	33.8 (180)	
Never	57.6 (2244)	28.4 (79)	8.5 (45)	
Environmental				
Breast-feeding				
Ever	68.9 (2698)	67.5 (189)	77.7 (410)	$P < .001$
Duration (mo)†	4.71	4.13	5.26*	$P < .05$*
Exclusive duration‡	2.75	2.69	2.85	
Parental history of allergy	57.7 (2277)	45.9 (129)	47.3 (253)	$P < .001$
Family size, no. of children§	2.51	2.58	2.65	
Unpasteurized milk consumption				
Never	90.7 (3384)	69.6 (185)	58.2 (304)	$P < .001$
Less than once per week	3.7 (137)	6.0 (16)	5.6 (29)	
1-2 times per week	1.2 (43)	1.9 (5)	2.7 (14)	
3-6 times per week	0.8 (29)	1.9 (5)	3.3 (17)	
Once per day or more	3.7 (137)	20.7 (55)	30.3 (158)	

Perkin & Strachan 2006

Table 1 Distribution of baseline characteristics of the cohort study by living environment[†‡]

Characteristics	Total	Non-rural	Rural non-farming	Rural farming	*P*-value*
Participants, *N*	13 524 (100.0%)	10 954 (86.94%)	1109 (5.67%)	1461 (7.39%)	
Age, year groups (%)					
0–1	17.35	17.72	12.76	16.48	<0.008
2–5	34.38	34.39	34.80	33.86	
6–11	48.28	47.89	52.43	49.66	
Gender (%)					
Male	50.01	49.84	51.26	51.10	0.69
Female	49.99	50.16	48.74	48.90	
Child allergy (%)					
Yes	11.31	11.24	11.44	12.03	0.57
No	88.68	88.75	88.56	87.94	
Child's health status (%)					
Rated low	9.08	9.07	8.91	9.39	0.96
Rated high	90.92	90.93	91.09	90.61	
No. of paediatrician visits (%)					
None	74.20	72.38	86.63	86.14	<0.01
One or more	25.80	27.62	13.37	13.86	
No. of physician visits (%)					
None	30.47	30.54	30.06	29.84	0.22
One	37.91	37.26	44.41	40.57	
Two or more	31.63	32.20	25.53	29.69	
Mother's age at child's birth (%)					
Less than 20 years	3.21	3.23	3.62	2.68	0.55
Greater than 20 years	96.79	96.77	96.38	97.32	
Older sibling (%)					
1 or more	44.72	45.92	38.89	34.95	<0.001
None	55.26	54.06	61.11	65.4	
Parental history of asthma (%)					
Yes	7.50	7.59	8.54	5.81	0.02
No	92.50	92.41	91.46	94.19	
Single parent (%)					<0.001
Yes	15.22	16.36	8.52	6.3	<0.001
No	84.78	83.64	91.48	93.10	
Immigrant mother (%)					
Yes	17.52	19.18	6.94	6.04	<0.001
No	81.20	79.45	92.35	93.25	
Either parent smokes (%)					
Yes	34.40	34.16	36.11	35.95	0.001
No	56.75	56.44	58.44	59.13	
Home needing repairs (%)					
Yes	23.60	22.13	29.30	36.69	<0.001
No	76.40	77.87	70.70	63.31	
Geographic region (%)					
Atlantic	7.66	6.99	19.87	6.21	<0.001
Quebec	23.50	24.91	13.03	14.94	
Ontario	37.63	37.83	39.33	33.91	
British Columbia	12.60	12.85	14.27	8.24	
Prairies	18.61	17.42	13.52	36.69	
BMI (kg/m^2), mean (SD)	18.22 (0.07)	18.22 (0.08)	18.32 (0.18)	18.26 (0.16)	0.34
Socioeconomic index, mean (SD)	−0.07 (0.01)	−0.04 (0.01)	−0.18 (0.03)	−0.25 (0.03)	<0.001
Crowding index (no./room), mean (SD)	1.39 (0.01)	1.38 (0.02)	1.38 (0.02)	1.43 (0.03)	0.011

Midodzi 2007

TABLE 2 Demographic, general characteristics and exposures to farm animals and unboiled fresh farm milk, stratified for farm and reference children

	Reference	Farm			
		All	Horticulture	Sheep and beef	Dairy
Children n	566	1333	241	552	540
Age yrs	11.00±3.56	11.20±3.49	11.44±3.50	11.14±3.56	11.15±3.43
Height m	1.49±0.22	1.50±0.22	1.52±0.20	1.50±0.21	1.49±0.22
Weight kg	45.97±19.14	45.15±17.69	45.28±16.29	44.97±18.61	45.28±17.38
Siblings n	2.07±1.35	2.06±1.13	1.89±0.99	1.98±1.09	2.22±1.22**
Males	51.2	52.1	49.0	53.4	52.2
Ethnicity					
New Zealand–European	65.2	95.0**	94.6**	94.9**	95.2**
Māori	32.1	4.7	4.6	5.1	4.4
Pacific Islander	2.7	0.3	0.8	0.0	0.4
Maternal education					
Secondary	59.4	48.7**	40.2**	46.1**	55.2
University	37.1	48.6	56.8	51.0	42.6
Current smoking in household	35.8	20.3**	13.8**	24.1**	19.3**
Reported conditions in parents					
Asthma	36.3	28.7**	25.3**	28.6**	30.3*
Hay fever	59.5	58.0	67.1*	54.3	57.2
Eczema	48.3	39.1**	40.8	37.2**	40.2**
Exposure of child to farm animals at least once a week					
Never	67.9	12.1**	42.8**	5.8**	4.9**
Aged 0–2 yrs	13.1	63.9**	25.8**	71.2**	73.3**
Aged >2 yrs	19.0	24.0**	31.4**	23.0**	21.9**
Exposure of child to farm animals in last 12 months					
Never	50.9	7.7**	34.0**	1.6**	2.0**
Less than once a week	38.2	23.4**	41.1**	20.5**	18.4**
At least once a week	6.0	32.4**	10.4**	36.3**	38.2**
At least once a day	4.9	36.6**	14.5**	41.6**	41.3**
Unboiled milk from farm currently					
Yes	3.1	19.0**	0.8	5.1	41.0**
Exposure of mother to farm animals					
Never	95.5	41.0**	83.4**	31.0**	32.1**
Less than once a week	1.6	11.6**	10.4**	14.0**	9.7**
At least once a week	0.7	15.6**	0.8**	20.8**	17.0**
At least once a day	2.1	31.8**	5.4**	34.2**	41.0**

Douwes 2008

TABLE I. Characteristics of the study population

Parameters	Nonfarming CBMCs, (n = 60)	Farming CBMCs (n = 22)	*P* value*
Maternal age (y), median (± IQR)	31.0 (27.0/34.5)	30.5 (24.0/34.0)	.33†
Maternal smoking, no. %			
No	**29 (48.3)**	**18 (81.8)**	
Yes, during pregnancy	**6 (10.0)**	**0 (0)**	
Yes, until pregnancy	**8 (13.3)**	**2 (9.1)**	**.04**
Yes, only before pregnancy	**17 (28.3)**	**2 (9.1)**	
Maternal education, no. (%)			
Elementary school	15 (25.0)	8 (36.4)	
High school	22 (36.7)	12 (54.5)	.06
Grammar school	12 (20.0)	0 (0.0)	
University	11 (18.3)	2 (9.1)	
Maternal atopic diseases, no. %			
Total	19 (31.7)	5 (22.7)	.43
Asthma	3 (5.0)	2 (9.1)	.61
Hay fever	14 (23.3)	2 (9.1)	.21
Atopic eczema	4 (6.7)	1 (4.5)	1.0
Maternal serum total IgE (IU/mL), median (± IQR)	34.3 (12.9/121.9)	28.3 (9.7/62.0)	.40†
Vaginal delivery, no. (%)	52 (86.7)	17 (77.3)	.32
Neonatal sex: male, no. (%)	32 (53.3)	10 (45.4)	.53
Gestational age (wk), median (± IQR)	40.0 (39.7/40.4)	40.1 (39.0/40.9)	.77†
Birth weight (g), median (± IQR)	3555 (3305/3865)	3575 (3220/3820)	.99†
Birth length (cm), median (± IQR)	52 (50/53)	52 (50/53)	.96†
Siblings, no. (%)			
0	30 (50)	10 (45.4)	
1	19 (31.7)	4 (18.2)	
2	5 (8.3)	5 (22.7)	
3	4 (6.7)	3 (13.6)	
4	2 (3.3)	0 (0)	.24

Values in boldface are significant.

[Schaub 2009]

TABLE II. Sociodemographic and farming characteristics of study participants

	Nonfarm families (N = 326, 52.2%)	Farm families (N = 299, 47.8%)	*P* value
Sex of newborn child (boy vs girl)	170 (53.0)	146 (49.3)	.37
Gestational age of newborn (wk), median (min-max)	40 (35-43)	40 (36-43)	.96*
Birth weight of newborn (g), median (min-max)	3445 (1990-4850)	3550 (1900-5100)	.0002*
Maternal age (y), median (min-max)	31.0 (19-44)	31.2 (21-48)	.074*
Maternal BMI (kg/m^2), median (min-max)	22.5 (16-37)	23.6 (18-44)	<.0001*
Maternal smoking during pregnancy (yes/no)	60 (18.4)	18 (6.0)	<.0001
Lower parental education level (yes/no)	146 (44.7)	175 (58.5)	.0006
First child of mother (yes/no)	153 (46.9)	70 (23.4)	<.0001
Maternal history of atopic diseases (yes/no)	162 (49.6)	124 (41.4)	.039
Paternal history of atopic diseases (yes/no)	155 (47.5)	101 (33.7)	.0002
Farm milk consumption during pregnancy			
As much as 200 mL per day	32 (9.9)	109 (36.6)	
More than 200 mL per day	12 (3.7)	114 (38.3)	<.0001
if yes, unboiled milk consumption (yes/no)	33 (80.5)	184 (83.6)	.62
if yes, unskimmed milk consumption (yes/no)	34 (82.9)	183 (82.8)	.98
Consumption of dairy products during pregnancy at least once a week			
Butter made of farm milk	5 (1.5)	40 (13.4)	<.0001
Yogurt made of farm milk	8 (2.5)	37 (12.4)	<.0001
Cheese made of farm milk	18 (5.5)	55 (18.5)	<.0001
Shop butter	210 (64.4)	205 (68.6)	.27
Shop yogurt	279 (85.6)	253 (84.6)	.73
Active working on a farm during pregnancy (yes/no)	28 (13.3)	281 (87.5)	<.0001
Average time spent in animal shed during pregnancy (h/wk), median (min-max)	0 (0-19.4)	11.3 (0-60.7)	<.0001*
Average time spent in barn during pregnancy (h/wk), median (min-max)	0 (0-19.4)	1.2 (0-42)	<.0001*
Contact to any farm animal species during pregnancy (at least several times per month)			
Contact with cow	64 (19.6)	266 (88.9)	<.0001
Contact with pig	14 (4.2)	63 (21.0)	<.0001
Contact with poultry	42 (12.8)	95 (31.7)	<.0001
Contact with sheep/goat	26 (7.9)	63 (21.0)	<.0001

Statistics given are N and % unless otherwise noted.
BMI, Body mass index; *min-max*, minimum-maximum.
*Wilcoxon-tests; otherwise, χ^2 tests.

[Pfefferle 2009]

TABLE I. Environmental and farming characteristics of pregnant women and children in the first year of life by farming status

	Farmer, no. (%)		Nonfarmer, no. (%)		*P* value for difference
	No.	Percent	No.	Percent	
Population at birth	530	46.8	603	53.2	
Male sex	266	51.4	294	51.4	.988
Center					
Austria	105	47.7	115	52.3	.389
Switzerland	107	44.2	135	55.8	
France	94	46.3	109	53.7	
Germany	112	44.1	142	55.9	
Finland	112	52.3	102	47.7	
Education					
Low	116	21.9	86	14.3	<.001
Medium	234	44.2	253	42.0	
High	180	34.0	264	43.8	
Maternal history of asthma	38	7.2	61	10.1	.080
Maternal history of hay fever	108	20.4	196	32.5	<.001
Maternal farming exposure during pregnancy*					
Contact with stable	464	89.6	107	18.9	<.001
Contact with barn	362	70.0	65	11.5	<.001
Contact with >2 farm animals	208	39.2	64	10.7	<.001
Contact with cats and/or dogs	430	81.3	233	38.6	<.001
Farm milk consumption	406	76.6	98	16.3	<.001
Only boiled farm milk	94	17.8	27	4.5	<.001
Any unboiled farm milk	310	58.7	70	11.6	
Smoking	46	8.7	112	18.6	<.001
Child's farming exposure during first year of life*†					
Population at year 1	493	47.7	540	52.3	
Child living on a farm	486	98.6	10	1.9	<.001
Regular visit to farm	487	99.0	77	14.4	<.001
Regular stay in stable	332	71.7	40	7.6	<.001
Contact with cats and/or dogs	402	81.5	188	34.8	<.001
Farm milk consumption	283	57.8	51	9.5	<.001
Only boiled farm milk	141	28.8	27	5.1	<.001
Any unboiled farm milk	142	29.0	24	4.5	
Unboiled farm milk after month 10	78	16.0	15	2.8	<.001
Unboiled farm milk before month 10	60	12.3	8	1.5	

Loss 2012

Table 1 Demographic data on the study populations

	Set A*	Set B	
		Nonfarm†	Farm†
	n = 36	*n* = 30	*n* = 28
Lifestyle C/P/A‡	13/7/16	11/9/10	10/8/10
Living on farm	7§	0	28
Maternal sensitization¶	17	8	8
Maternal rhinoconjunctivitis**	16	6	5
Paternal sensitization¶	12	11	9
Paternal rhinoconjunctivitis**	10	11	8
Mode of delivery vaginal/caesarean	27/9	28/2	27/1
Boys/girls	19/17	15/15	16/12
Maternal age, median (range)	32 (21–43)	33 (22–41)	33 (22–47)

Slaats 2012

Table 1 Characteristics of the studied population.

	Total *n* = 1003		Rural *n* = 189		Urban *n* = 814		*p*
	n	%	*n*	%	*n*	%	
Sex, male	474	47.6	87	46	387	47.7	0.676
Family atopy							
Mother with asthma	53	5.3	13	6.9	40	4.9	0.227
Father with asthma	41	4.1	9	4.8	32	3.9	0.603
Mother with allergies	151	15.1	33	17.5	118	14.5	0.305
Father with allergies	80	8.0	14	7.4	66	8.1	0.749
Other family member	342	34.2	70	37.0	272	33.5	0.355

Bedolla-Barajas 2017

TABLE I. Maternal, child, and household characteristics according to farm status

Characteristic	Farm (n = 111)	Nonfarm (n = 129)	*P* value
Maternal			
Maternal age (y)			.12
≥40	2%	2%	
35-39	20%	9%	
30-34	40%	44%	
25-29	32%	40%	
18-24	7%	5%	
Education			.62
High school or less	6%	6%	
Associate degree or some college	29%	28%	
Bachelor's degree	50%	45%	
Graduate degree	11%	18%	
Unknown	4%	3%	
Employed outside the home	60%	78%	.005
Annual household income			.24
≥$100,000	18%	22%	
$25,000-$99,999	63%	68%	
<$25,000	9%	4%	
Unknown	10%	6%	
Marital status			.37
Married or living with a partner	89%	88%	
Single	5%	8%	
Unknown	6%	4%	
Maternal smoking			
During year before pregnancy	9%	15%	.17
During pregnancy	2%	4%	.33
Maternal history of AD (ever)	18%	20%	.67
Maternal history of allergic rhinitis (ever)	11%	18%	.10
Maternal history of asthma (ever)	16%	21%	.37
Consumption of raw farm milk during pregnancy	15%	2%	<.001
Child			
Sex			.02
Female	43%	58%	
Race/ethnicity			.07
White	99%	94%	
Black or African American	1%	2%	
Asian	0%	2%	
Other	0%	2%	
Mode of delivery			
C-section (vs vaginal)	17%	21%	.45
Child daycare attendance at least 1 d/wk (age 2 mo)	14%	21%	.13
Exclusively breast milk fed (age 2 mo)	50%	47%	.64
Household			
No. of children in household			.08
≥4	19%	12%	
3	23%	15%	
2	26%	42%	
1	25%	23%	
Unknown	7%	8%	
Dog ownership (prenatal)	73%	52%	<.001
Dog spends time indoors	47%	52%	.43
Cat ownership (prenatal)	76%	32%	<.001
Cat spends time indoors	37%	29%	.22

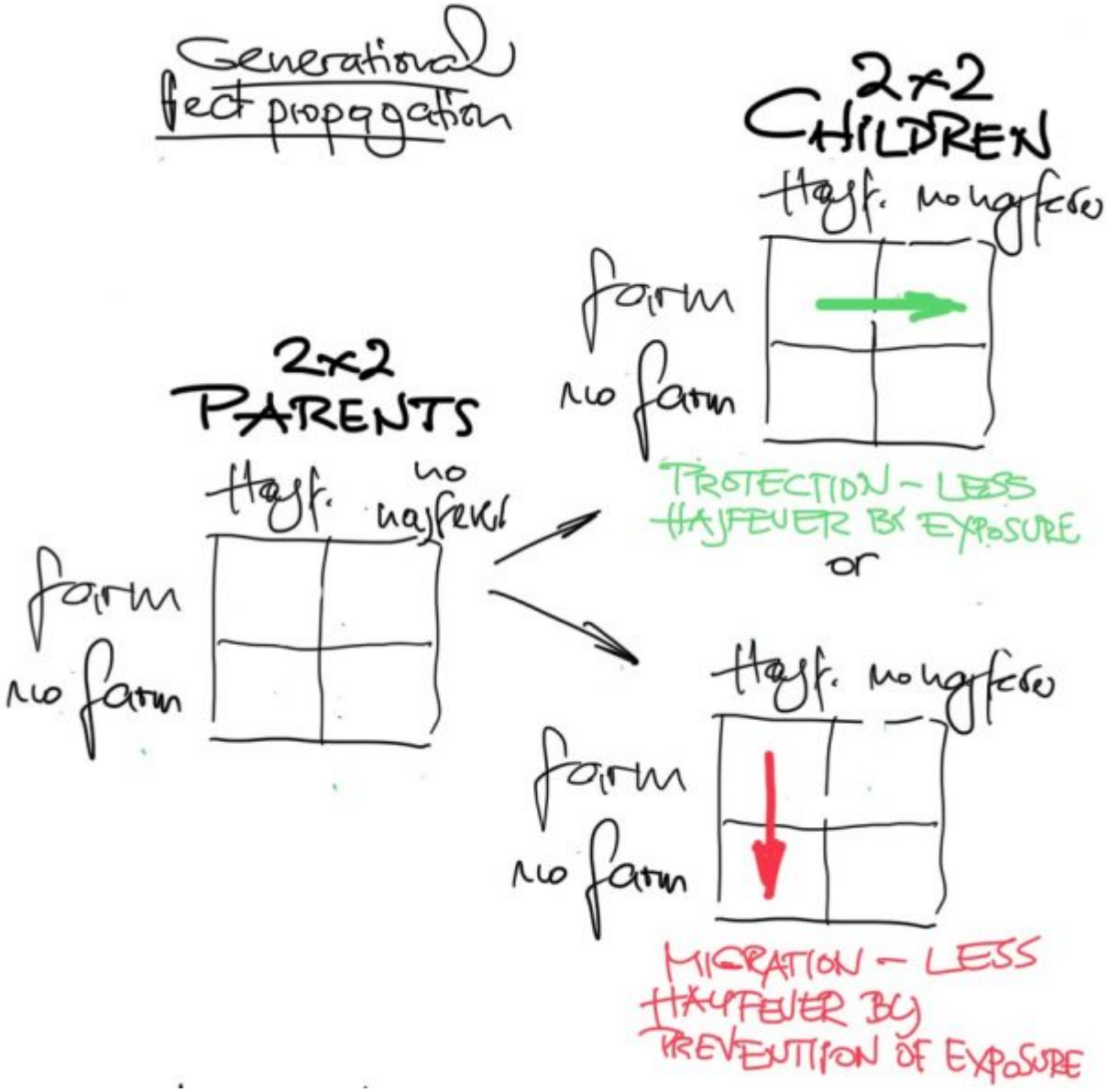
NS, Not significant.

Steiman 2020

Unfortunately the disease definitions in these papers is sometimes vague – does history mean both parents only? Grandparents and sibs? Is the history verified? So it is difficult to run a formal meta-analysis here, while the message should be already clear: All except one minor study show that the farming effect is found in parents also,

Again – was there already “protection” during the childhood of the parents or is it just a delayed healthy worker effect? I am going to answer this question by looking into effect propagation in the Ehrenstein paper as this is one of the largest study so far.

The analysis basically works by running a 2×2 table in the parental generation (a bit questionable as we have 2 parents) and another 2×2 table in the child generation. Effect should propagate as indicated by movement of observed versus expected cases between cells. Expected are row sum * col sum / total sum.



If there is any true effect, there should be a horizontal movement between parents and children, basically just less hayfever in the farming group. If there is a pseudo effect there should be a vertical movement, eg less hayfever by less allergic parents who left the farm. So judge yourself now or wait for my forthcoming paper.

Update 1 Nov 2025

As the full paper is now more than 1 year under review, I have uploaded it now to a preprint server.