

## Longitudinal Asthma Patterns In A Large Cohort Of Us Women With 22-Year Follow-Up

**O. Dumas<sup>1</sup>, R. Varraso<sup>1</sup>, F. E. Speizer<sup>2</sup>, C. A. Camargo<sup>3</sup>**

<sup>1</sup>Inserm, U1168, VIMA (Aging and chronic diseases. Epidemiological and public health approaches), Villejuif, France, <sup>2</sup>Channing Division of Network Medicine, Department of Medicine, Brigham and Women's Hospital and Harvard Medical School, Boston, MA, <sup>3</sup>Department of Emergency Medicine, Massachusetts General Hospital, Boston, MA

**Corresponding author's email: orianne.dumas@inserm.fr**

**Rationale:** Asthma is a heterogeneous disorder with variable clinical expression. However, limited data are available on asthma temporal variability in adults over long time periods. To address this question in general health epidemiological cohorts, prior work has proposed the derivation of longitudinal patterns from repeated answers to a simple question on asthma. Using data from a large prospective cohort of US female nurses followed for 22 years, we evaluated this novel approach to measure asthma temporal variability.

**Methods:** The Nurses' Health Study II is a prospective study of 116,430 US female nurses enrolled in 1989 (ages 24–44 years). In biennial questionnaires (1991–2013), participants were asked to report physician-diagnosed condition(s) they had since the last questionnaire cycle, including asthma (repeated simple asthma question). Supplemental questionnaires on asthma were sent in 1998, 2003 and 2014 to all women who had reported physician-diagnosed asthma in earlier biennial questionnaire(s). Among women with prevalent asthma in 1991 (n=7,325), we defined longitudinal patterns (1993-2013) based on the number of positive answer to the simple asthma question. Analyses were restricted to women who returned at least 6 out of 11 follow-up questionnaires (n=6,698, 91%). Detailed asthma data from at least one supplemental questionnaire was available for 6,434 (96%) of them. We examined association between longitudinal asthma patterns and indicators of asthma severity/control from supplemental asthma questionnaires.

**Results:** The number of positive answer to the simple asthma question (biennial questionnaires, 1991-2013, median: 7) was classified as follows: 1 (13%), 2-4 (21%), 5-7 (21%), 8-10 (26%), 11-12 (19%). Strong, significant, dose-response relationships were observed (table) between the number of positive answer to the simple asthma question and indicators of asthma severity or poor asthma control in supplemental questionnaires: use of beta-agonist inhaler (22% among women with only one positive answer vs. 98% among women with 11-12 positive answers) and corticosteroids inhaler (7% vs. 83%); emergency room visits for asthma treatment (0.1% vs. 17%). Similar associations were observed when examining formally defined asthma control (asthma control test score <20: 3% vs. 23%).

**Conclusion:** Longitudinal patterns derived from repeated answers to a simple asthma question were a useful measure of asthma temporal variability in a large population study. The patterns represent an interesting opportunity to define longitudinal phenotypes addressing asthma persistence and lack of asthma control over time. We will further use repeated measurement of asthma in a longitudinal cluster analysis to identify 22-year asthma trajectories in women.

**Table.** Association between 22-year longitudinal asthma patterns and indicators of asthma severity/control from supplemental asthma questionnaires among n=6,634 women with prevalent asthma in 1991

	Number of positive answer to the simple asthma question*					p‡
	1 (13%)	2-4 (21%)	5-7 (21%)	8-10 (26%)	11-12 (19%)	
Asthma treatment in the past year†						
Beta-agonist inhaler	22	51	76	91	98	<0.001
Corticosteroid inhaler	7	22	46	67	83	<0.001
Doctor visits for urgent treatment of asthma in the past year†	4	17	29	44	56	<0.001
ER visit(s) for asthma treatment in the past year†	0.1	4	7	11	17	<0.001
Hospitalization because of asthma in the past year†	0.1	1	2	4	6	<0.001
Asthma control test score (2014 supplemental questionnaire, n=3,773)						
25	82	72	58	38	28	<0.001
20-24	15	23	30	44	49	
16-19	2	3	8	12	14	
<15	1	2	4	6	9	

Results presented as %. \* Physician-diagnosed asthma (yes/no) since the last questionnaire cycle, in biennial questionnaires. † In at least one supplemental asthma questionnaire (1998, 2003, or 2014).

‡ From chi-2 tests

ER – Emergency Room

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