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REFERENCES

1. **Gelb AF**, George SC, Silkoff PE, *et al.* Central and peripheral airway/alveolar sites of exhaled nitric oxide in acute asthma. *Thorax* 2010;**65**:619–25.
2. **Mahut B**, Trinquart L, Le Bourgeois M, *et al.* Multicentre trial evaluating alveolar NO fraction as a marker of asthma control and severity. *Allergy* 2010;**65**:636–44.
3. **Mahut B**, Delclaux C, Tillie-Leblond I, *et al.* Both inflammation and remodeling influence nitric oxide output in children with refractory asthma. *J Allergy Clin Immunol* 2004;**113**:252–6.
4. **Puckett JL**, Taylor RW, Leu SY, *et al.* Clinical patterns in asthma based on proximal and distal airway nitric oxide categories. *Respir Res* 2010;**11**:47.
5. **Delclaux C**, Sembach N, Claessens YE, *et al.* Offline exhaled nitric oxide in emergency department and subsequent acute asthma control. *J Asthma* 2008;**45**:867–73.

Author's response

I want to thank Drs Mahut and Delclaux for their interesting letter concerning our recent paper¹ and would offer the following response. During acute asthma exacerbation only two of 15 patients with asthma (13%) had a combined abnormally elevated central airways nitric oxide (NO) flux and elevated peripheral airway/alveolar NO concentration after correction for NO axial back-diffusion. Central airways NO flux remained the major site of 'NO-mediated inflammation' in 13 of 15 patients with asthma since two had normal NO gas exchange despite acute exacerbation.¹ This latter observation needs to be further investigated since the clinical response was similar to that in patients with asthma with abnormal NO gas exchange. Many years ago we investigated the simplified detection of peripheral airway disease and showed that analyses of the distal part of the maximum expiratory flow–volume curve were helpful.² However, in a subsequent study³ we reported that, if the ratio of forced expiratory volume in 1 s to forced vital capacity (FEV₁/FVC) was $\geq 75\%$, the occurrence of an isolated abnormal mid forced expiratory flow (FEF_{25–75}) was rare. However, if the FEV₁/FVC was $< 75\%$, it would not be unusual to find an abnormal FEF_{25–75}, but it would not discriminate peripheral from large central airways obstruction.³ I hope these comments are helpful and appreciate their interest.

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REFERENCES

1. **Gelb AF**, George SC, Silkoff PE, *et al.* Central and peripheral airway/alveolar site of exhaled nitric oxide in acute asthma. *Thorax* 2010;**65**:619–25.
2. **Gelb AF**, Zamel N. Simplified diagnosis of small-airways obstruction. *N Engl J Med* 1973;**288**:395–8.
3. **Gelb AF**, Williams AJ, Zamel N. Spirometry. FEV₁ vs FEF_{25–75} percent. *Chest* 1983;**84**:473–4.

Definitions are important and not all wheeze is asthma

We read with great interest the paper by Moncayo *et al*¹ showing a predominance of non-atopic compared with atopic wheeze in children in rural Ecuador. Undoubtedly their study adds to the literature regarding the influence of environmental factors, particularly chronic helminth infections, on wheezing phenotypes. However, we feel that the interpretation and presentation of findings in this paper is open to question. This concern stems from the authors' lack of distinction between wheeze and asthma. While the analysis focused predominantly on current wheeze, subsequent discussion (and, indeed, the title) presents this as asthma.

There is good evidence for the validity of a questionnaire-based definition of asthma.² Our understanding of the definition of asthma used in this paper was of a positive response to 'wheeze in the last 12 months'. Yet wheeze may not necessarily reflect asthma, particularly in childhood where both acute infection and chronic illness might be associated with wheeze. Using only one symptom therefore runs the risk of poor discriminatory value between asthma and other causes of wheeze, making this definition of asthma potentially problematic.³

Relying on 'current wheeze' to represent asthma may also exclude a substantial proportion of 'ever wheezed' subjects, given the heterogeneous nature of childhood wheeze⁴ and the relapsing and remitting course it may run.⁵ There is therefore an additional risk of misclassification where subjects with asthma who were currently asymptomatic are regarded as non-asthmatic. Given that the stated principal aim of this study was to investigate risk factors for asthma/wheeze, exclusion of those without current symptoms potentially provides an incomplete picture of risk, especially when one considers that 'ever wheezing' has been shown to be a superior predictor of lifetime asthma diagnosis.⁵

Ultimately, asthma is a clinical diagnosis and no questionnaire-based definition can be all-encompassing. Since none of the children in this study were on regular asthma medication, perhaps combining current wheeze with the number of wheezing episodes and including a variable of 'ever wheeze' in the

diagnostic criteria might have better selected participants with a greater likelihood of asthma.

In summary, we feel that the distinction between asthma and wheeze is important to recognise and this paper fails to clearly acknowledge this. Finally, we thank the authors for describing some of our previous findings from the Isle of Wight Birth Cohort,⁴ but wish to clarify that those findings related to atopic/non-atopic wheeze and not asthma as they suggest in the introduction to their paper.

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REFERENCES

1. **Moncayo AL**, Vaca M, Oviedo G, *et al.* Risk factors for atopic and non-atopic asthma in a rural area of Ecuador. *Thorax* 2010;**65**:409–16.
2. **Jenkins MA**, Clark J, Carlin J, *et al.* Validation of questionnaire and bronchial hyperresponsiveness against respiratory physician assessment in the diagnosis of asthma. *Int J Epidemiol* 1996;**25**:609–16.
3. **Lukrafka JL**, Fuchs SC, Moreira LB, *et al.* Performance of the ISAAC questionnaire to establish the prevalence of asthma in adolescents: a population-based study. *J Asthma* 2010;**47**:166–9.
4. **Kurukulaaratchy RJ**, Fenn MH, Waterhouse LM, *et al.* Characterization of wheezing phenotypes in the first 10 years of life. *Clin Exp Allergy* 2003;**33**:573–8.
5. **Pippo-Savolainen E**, Korppi M. Wheezy babies–wheezy adults? Review on long-term outcome until adulthood after early childhood wheezing. *Acta Paediatr* 2008;**97**:5–11.

Author's response

Drs Marsh and colleagues are essentially correct in saying that the word 'wheeze' rather than 'asthma' may have been more appropriate in the title of our paper. Not all wheeze is asthma but, given the lack of a widely agreed definition for asthma, we chose to use a simple but widely used definition (wheeze in the past 12 months) in this Ecuadorian study to estimate prevalence. As the authors will have seen from the abstract, the aim of the study was to investigate risk factors for atopic and non-atopic wheeze illness to understand better those that may cause or protect against asthma in the study population.¹

All subjects with wheeze in the past 12 months had a history of wheeze ever. A high proportion of children in the study population had a history of wheeze ever (32.5%), most of which could be attributed

to respiratory tract infections in earlier childhood (unpublished findings of cohort and cross-sectional studies of children aged up to 5 years in the same population in Esmeraldas Province, Ecuador) and, as a definition of asthma, would be subject to much greater misclassification. We did consider a more complex definition to increase specificity but decided against this because of a lack of validation.

Wheeze in the past 12 months is now the most widely used definition for asthma in epidemiological studies^{2,3} and, although we agree it may be subject to some misclassification, such a definition has three important advantages: (1) simplicity, permitting widespread use in epidemiological studies; (2) the definition is more inclusive and, where a word for the symptom exists in the local language that is linked culturally with asthma, may be less subject to bias in poor populations (see below); and (3) its wide use permits comparison between studies of the role of potential risk factors and more powerful analyses across studies of potential risk factors with a wide range in the prevalence of exposure. Examples of the latter are phases I–III of the International Study of Asthma and Allergies in Childhood (ISAAC) which have made important contributions to our understanding of asthma internationally.⁴ Furthermore, other definitions may be more prone to misclassification bias. For example, a doctor diagnosis of asthma is widely used^{5,6} but is unlikely to be helpful in populations with very limited access to healthcare such as the population where we conducted this research in rural Ecuador.

The distinction between different asthma/wheeze phenotypes remains an area of considerable debate⁷ and such phenotypes may not necessarily be uniform across different populations. Given the lack of consensus on how to measure asthma in epidemiological studies, we believe that wheeze in the past 12 months is as good as any definition presently available, but certainly agree that such a definition has its limitations.

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REFERENCES

1. **Moncayo AL**, Vaca M, Oviedo G, *et al*. Risk factors for atopic and non-atopic asthma in a rural area of Ecuador. *Thorax* 2010;**65**:409–16.
2. **The International Study of Asthma and Allergies in Childhood (ISAAC) Steering Committee**. Worldwide variation in prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and atopic eczema: ISAAC. *Lancet* 1998;**351**:1225–32.
3. **Asher MI**, Montefort S, Björkstén B, *et al*. Worldwide time trends in the prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and eczema in childhood: ISAAC phases one and three repeat multicountry cross-sectional surveys. *Lancet* 2006;**368**:733–43.
4. **Pearce N**, Ait-Khaled N, Beasley R, *et al*. Worldwide trends in the prevalence of asthma symptoms: phase III of the International Study of Asthma and Allergies in Childhood (ISAAC). *Thorax* 2007;**62**:758–66.
5. **Zöllner IK**, Weiland SK, Piechotowski I, *et al*. No increase in the prevalence of asthma, allergies, and atopic sensitisation among children in Germany: 1992–2001. *Thorax* 2005;**60**:545–8.
6. **Stern DA**, Morgan WJ, Halonen M, *et al*. Wheezing and bronchial hyper-responsiveness in early childhood as predictors of newly diagnosed asthma in early adulthood: a longitudinal birth-cohort study. *Lancet* 2008;**372**:1058–64.
7. **Spycher BD**, Silverman M, Kuehni CE. Phenotypes of childhood asthma: are they real? *Clin Exp Allergy* 2010;**40**:1130–41.

Seasonality and attendance at a pulmonary rehabilitation programme

Pulmonary rehabilitation (PR) programmes have been shown to reduce symptoms, improve exercise tolerance and reduce readmission rates in chronic obstructive pulmonary disease (COPD).^{1,2} PR has the potential to reduce the economic burden of COPD upon the NHS but, if poor attendance results in groups running at less than capacity, the cost-effectiveness of the service is markedly reduced. Understanding and responding to the factors that influence attendance is vital to ensuring maximum benefit is gained from PR programmes. The role of seasonality in attendance at PR programmes has not previously been evaluated, and there is conflicting evidence regarding the role of seasonality from other outpatient settings.^{3,4}

We reviewed attendance rates between 2007 and 2010 at our PR programme in a central London borough. We collected data on attendance at initial assessments and subsequent biweekly PR sessions and examined the data by season, winter months incorporating October to March and summer months April to September.

During this period 506 assessment appointments were made to achieve 258 attendances, an attendance rate of 51%. For assessments, there was no difference in attendance between the winter and summer months (50% and 51%, respectively). The overall attendance rate at the PR group sessions was 69% (2325 appointments were made to achieve 1613 attendances). The attendance rate at group sessions during winter was 64% compared with 74% during summer. A Mann–Whitney U test was performed to compare monthly attendance rates and showed the seasonal difference to be statistically significant ($p < 0.05$).

The attendance data were correlated with local monthly weather data using the Pearson product moment correlation coefficient. Attendance rates showed a weak positive correlation with maximum and minimum temperatures ($r = 0.51$ and $r = 0.44$, respectively) and with sunlight hours ($r = 0.55$), and a weak negative correlation with amount of rainfall ($r = -0.33$).

Attendance rates at assessments were worse than for the subsequent PR sessions and showed no seasonal variation. However, attendance rates at the PR sessions themselves were significantly worse during winter months than during the summer months. In practice, this corresponds to increased time spent arranging and rearranging appointments, leaving PR groups with unfilled spaces. This pattern has not previously been explored in the literature despite the well-documented association between seasonality and COPD symptoms and exacerbations.⁵ The weak correlation we found between attendance and specific weather indicators suggests that weather conditions may contribute to this pattern. However, confounding patient factors such as illness exacerbation and environmental issues such as transport are likely to play an important role, and these need to be further evaluated in the context of seasonality to better understand this relationship. The patterns we observed need to be taken into account when planning PR services, and we hope to open up a discussion into potential methods of addressing this variation in order to maximise patient participation and hence service effectiveness.

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