Validation of prediction tool (PARC)

# Display items

**Table 1:** Inclusion criteria and outcome definitions in LRC and ALSPAC

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| LRC: items for inclusion criteria\*(at age 1-3 years) | | Answer categories | ALSPAC: items for inclusion criteria\* (at age 0.5, 1.5, 2.5 years) | | Answer categories | Comparability |
| Has your child had wheezing or whistling in the chest in the last 12 months? | Yes, no | | Has he had any of the following the last 12 months, wheezing? | Yes and saw a doctor  Yes but did not see doctor  No did not have | | Good |
|  |  | |  |  | |  |
| Does your child usually have a cough without colds? | Yes, no | | Has he had any of the following the last 12 months, cough? | Yes and saw a doctor  Yes but did not see doctor  No did not have | | Moderate |
|  |  | |  |  | |  |
| In the last 12 months, has your child had a dry cough at night, apart from a cough associated with a cold or a chest infection? | Yes, no | | No question | - | | - |
|  |  | |  |  | |  |
| How often did your child see a GP for coughing or wheezing during the last 12 months? | Never, once, 2-3 times, 4-6 times, 7 or more times | | Has he had any of the following the last 12 months, wheezing? | Yes and saw a doctor  Yes but did not see doctor  No did not have | | Good |
|  |  | |  |  | |  |
| In the last 12 months, has wheezing or asthma resulted in your child: (4 categories: referred/admitted to hospital, attending/calling ER or GP) | Yes, no | | No question | - | | - |
| LRC: items for outcome definition@ (at 8 years) | **Answer categories** | | **ALSPAC: items for outcome definition@ (at 7.5 years)** | | **Answer categories** | **Comparability** |
| Has your child had wheezing or whistling in the chest in the last 12 months? | Yes, no | | Has he had any of the following in the past 12 months, wheezing? | Yes and saw a doctor  Yes but did not see doctor  No did not have | | Very good |
|  |  | |  |  | |  |
| Did your child take any of the following during the last 12 months? (4 categories: inhalers by content/type) | Yes, no, don’t know | | Please indicate which of the following have been given to your child the last 12 months. - Asthma medication? | Never  Yes for 1-2 episodes only  Yes for 3 or more episodes | | Very good |

\***Inclusion criteria LRC**: Wheeze or cough (cough without colds or cough at night) with 1 or more visits to the doctor for wheeze or cough during the past 12 months). **Inclusion criteria ALSPAC:** Wheeze or cough during the past 12 months and saw a doctor for one of these problems (answer category: yes and saw a doctor). **@Outcome definition LRC:** ‘Yes’ to wheeze and use of asthma medication past 12 months. Outcome definition ALSPAC: **Outcome definition ALSPAC**: ‘Yes’ to wheeze and use of asthma medication past 12 months.

**Table 2:** Comparison of study characteristics and demographic factors in development cohort (LRC) and external validation cohort (ALSPAC)

|  |  |  |
| --- | --- | --- |
|  | Development cohort (LRC)  N=1226 | Validation cohort (ALSPAC)  N=2690 |
| Location | Leicestershire (United Kingdom) | Bristol (United Kingdom) |
|  |  |  |
| Study design | Prospective cohort (from birth) | Prospective cohort (from pregnancy) |
|  |  |  |
| Recruitment | General population random sample | General population random sample |
|  |  |  |
| Year of birth | 1995-1997 | 1991-1992 |
|  |  |  |
| Sex |  |  |
| male | 678 (55) | 1433 (54) |
|  |  |  |
| Ethnicity |  |  |
| White | 797 (69) | 2580 (98) |
| South Asian | 305 (26) | - |
| Other | 57 (5) | 52 (2) |
|  |  |  |
| Baseline Assessment |  |  |
| Age® |  |  |
| 1 year | 336 (27) | 763 (28) |
| 2 years | 702 (57) | 1516 (56) |
| 3 years | 188 (15) | 411 (15) |
| Wheeze\* prevalence | 766 (62) | 791 (29) |
| Cough\* prevalence | 1085 (89) | 2654 (99) |
|  |  |  |
| Follow-up Assessment |  |  |
| Age |  |  |
| 6 years | 336 (27) |  |
| 7 years | 702 (57) | 2690 (100) |
| 8 years | 188 (15) |  |
| Wheeze\* prevalence | 427 (35) | 451 (17) |
| Cough\* prevalence |  |  |
| Use of asthma medication\* | 345 (28) | 586 (22) |
| Wheeze\* + use of asthma medication\* | 345 (28) | 373 (14) |

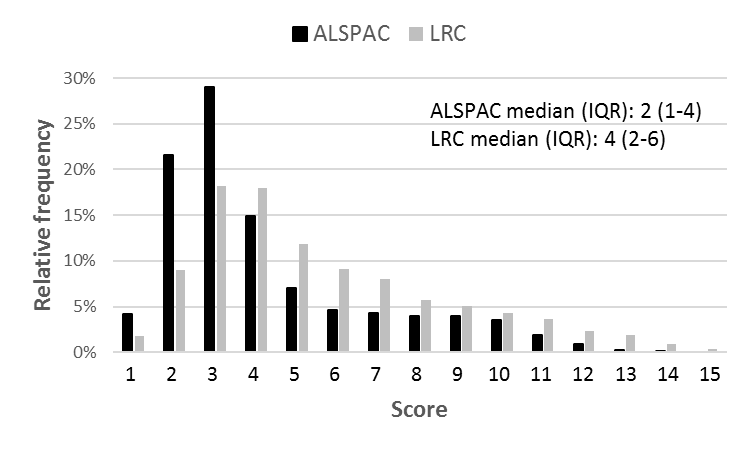
**This table is displayed using n (%) unless otherwise stated. ®The age distribution at baseline in ALSPAC was matched to the baseline age distribution in LRC, \* in the past 12 months. Prevalence of wheeze and cough is so high, because only children with lower respiratory symptoms were included.**

**Table 3:** Questionnaire items used for scoring and their distribution in LRC and ALSPAC

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Item Nr.** | **Question item in LRC** | **Score value** | **(%)** | **Questionnaire item in ALSPAC** | **Score value** | (%) | Comparability |
| **1** | What is the child’s sex | Female = 0 | (45) | Sex | Female = 0 | (47) | Perfect |
|  |  | Male = 1 | (55) |  | Male = 1 | (53) |  |
| **2** | How old is the child? | 1 years = 0  2 years = 1  3 years = 1 | (27)  (57)  (15) | Age | 1 years = 0  2 years = 1  3 years = 1 | (28)  (57)  (15) | Perfect |
| **3** | In the last 12 months, has the child had wheezing or whistling in the chest even without having a cold or flu? | No = 0  Yes = 1 | (82)  (18) | Since she was 6/18/30\* months old has she had any periods when there was wheezing with whistling on her chest when she breathed? | No = 0  Yes = 1 | (71)  (29) | Moderate. Question does not include ‘without cold’ |
| **4** | How many attacks of wheeze has the child had during the last 12 months? | 0-3 = 0  >3 = 2 | (77)  (23) | Has your baby ever had wheezing with whistling on her chest when she breathed?  b) How many separate times has this happened | 0-3 = 0  >3 = 2 | (82)  (18) | Very good |
| **5** | In the last 12 months, how much did wheezing interfere with your child’s daily activities? | Never=0  A little = 1  A lot = 2 | (64)  (26)  (10) | Proxy: ‘how many days altogether would you say he had wheezed in the past 12 months?’ | 0-3 days = 0  4-19 days = 1  20 or more days = 2 | (77)  (16)  (7) | Poor. Different question. |
| **6** | Do these wheezing attacks cause him/her to be short of breath? | Never = 0  Sometimes = 2  Always = 3 | (65)  (29)  (6) | Since she was 6/18/30\* months old has she had any periods when there was wheezing with whistling on her chest when she breathed?  d) Was he breathless (struggling for breath) during any of these times? | No for all = 0  Yes for some = 2  Yes for all = 3 | (84)  (15)  (1) | Very good |
| **7** | In the last 12 months, did exercise (playing, running) or laughing, crying or excitement cause wheezing or coughing in the child? | No = 0  Yes = 1 | (61)  (39) | has your baby ever had wheezing with whistling on her chest when she breathed?  g) what do you think brings them on? (exercise, emotion) | No = 0  Yes = 1 | (99)  (1) | Moderate. Optional free text field – few answers |
| **8** | In the last 12 months, did contact with dust, grass, pets or other animals cause wheezing or coughing in the child? | No = 0  Yes = 1 | (93)  (7) | has your baby ever had wheezing with whistling on her chest when she breathed?  g) what do you think brings them on? (allergy) | No = 0  Yes = 1 | (99)  (1) | Moderate. Optional free text field – few answers |
| **9** | Has the child ever had eczema? | No = 0  Yes = 1 | (57)  (43) | Has the baby had a rash in the joints and creases of her body (e.g. behind the knees, under the arms)? | No = 0  Yes = 1 | (71)  (29) | Good. Asking about rash instead of eczema |
| **10** | Has the child’s parents ever suffered from wheezing, asthma or bronchitis? | None = 0  Mother = 1  Father = 1  Both = 1 | (52)  (17)  (22)  (9) | Have you ever had any of the following problems: asthma/ Wheezing past 2 years  Have you had wheeze or bronchitis since the child was born (8 month after birth) | None = 0  Mother or father = 1  Both = 1 | (65)  (31)  (4) | Moderate. Information asked from partner instead of father. |

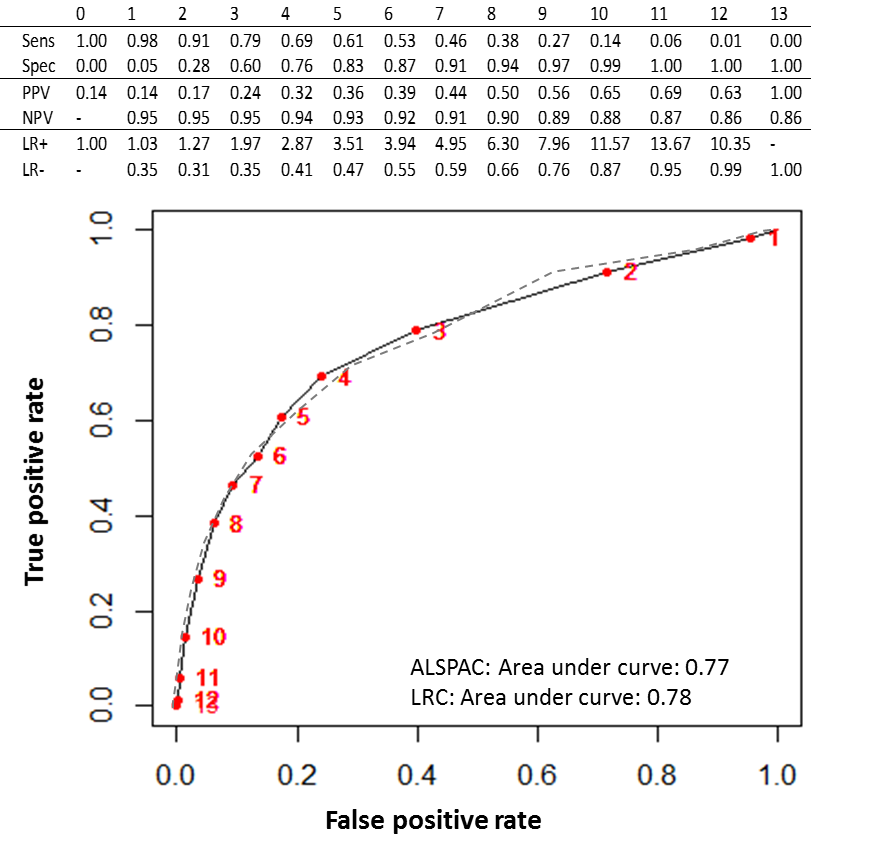
\*ages correspond to age 12 months prior to questionnaire mailing

**Figure 1:** Distribution of the PARC scores\* (relative frequency) in the external validation population (ALSPAC, n=2690, black) and original development population (LRC, n=1226, grey).

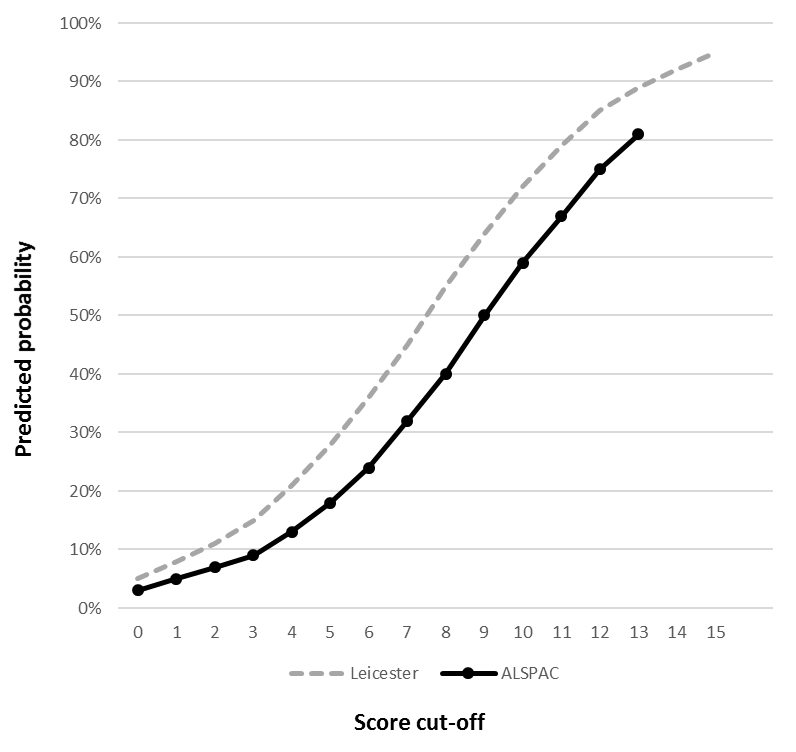


\*Score based on items described in table 3 for ALSPAC and LRC, respectively. Abbreviations; ALSPAC: Avon Longitudinal Study of Parents and Children, LRC: Leicestershire Respiratory Cohorts, IQR: Interquartile range

**Figure 2:** Receiver operating characteristic (ROC) from validation population ALSPAC (solid line) and the original development population LRC (dashed line). Numbers (1-13) indicate asthma prediction score values and their corresponding positions (indicated in red on the figure). The area under the curve (AUC) corresponds to the primary outcome in both cohorts. The table above the figure shows sensitivity (Sens), specificity (Spec), positive and negative predictive values (PPV, NPV) and likelihood ratios (LR+, LR-) for each score point in ALSPAC.



**Figure 3:** Predicted probability of developing asthma at follow-up in LRC (dashed grey line) and probabilities predicted by the recalibrated model in ALSPAC (black line).



**Figure 4**: Calibration assessment of predicted probabilities vs. observed asthma frequencies in seven equally sized groups. Figure A displays the calibration assessment for the predicted probabilities calculated in LRC. Figure B displays the probabilities predicted by the recalibrated model in ALSPAC. Shaded areas represent exact pointwise 95%-CI for asthma frequency. The diagonal red line represents perfect calibration.

