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Nocturnal asthma is affected by genetic interactions between *RORA* and *NPSR1*

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Short title: *RORA* and *NPSR1* affect nocturnal asthma

Keywords: nighttime asthma, childhood asthma, genetic epistasis, circadian rhythm

Abstract

Background: *Neuropeptide S Receptor 1* (*NPSR1*) and *Retinoid Acid Receptor-Related Orphan Receptor Alpha (RORA*) interact biologically, are both known candidate genes for asthma and are involved in controlling circadian rhythm. Thus, we assessed (1) whether interactions between *RORA* and *NPSR1* specifically affect the nocturnal asthma phenotype and (2) how this may differ from other asthma phenotypes.

Methods: Interaction effects between 24 SNPs in *RORA* and 35 SNPs in *NPSR1* on asthma and nocturnal asthma symptoms were determined in 1,432 subjects [763 asthmatics (192 with nocturnal asthma symptoms); 669 controls] from the MAGICS/ISAAC studies. The results were validated and extended in children from MAAS (N=723) and the BAMSE cohort (N=1,646).

Results: *RORA*NPSR1* interactions seemed to affect both asthma and nocturnal asthma. In stratified analyses, however, interactions mainly affected nocturnal asthma and less so asthma without nocturnal symptoms or asthma severity. Results were replicated in two independent cohorts and seemed to remain constant over time throughout youth.

Conclusion: *RORA*NPSR1* interactions appear to be involved in mechanisms specific for nocturnal asthma. In contrast to previous studies focusing on the role of beta 2 receptor polymorphisms in nocturnal asthma as a feature of asthma control or severity in general, our data suggests that changes in circadian rhythm control are associated with night-time asthma symptoms.

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Abbreviations

BAMSE	Children Allergy Milieu Stockholm an Epidemiological study
CI	Confidence Interval
DPY19L1	DPY19 like C-mannosyltransferase 1
GATA3	GATA binding protein 3
GWAS	Genome-wide association study
HWE	Hardy-Weinberg Equilibrium
IL4	Interleukin 4 gene
IL5	Interleukin 5 gene
IL13	Interleukin 13 gene
ISAAC II	International Study of Asthma and Allergies in Childhood phase II
LD	Linkage Disequilibrium
MAGIC	Multicenter Asthma Genetic in Childhood
NPS	Neuropeptide S
NPSR1	Neuropeptide S Receptor 1 gene
OR	Odds Ratio
P300	Histone acetyltransferase p300
QC	Quality control
RORA	Retinoic acid receptor-related Orphan Receptor Alpha gene
Rs	Reference SNP cluster code (dbSNP)
SNP	Single Nucleotide Polymorphism
STAT3	Signal transducer and activator of transcription 3

INTRODUCTION

Nocturnal asthma is defined as night-time occurrence of asthmatic symptoms such as wheezing, coughing, or chest tightness [1,2]. Between 30 and 75% of asthma patients experience these symptoms [3–5]. It is known that the circadian rhythm controls airway inflammation, vagal activity, and epinephrine release [6], thus potentially aggravating asthma symptoms during the night [6,7]. Nocturnal asthma may either be a feature related to asthma severity or alternatively, it may be a subphenotype of the disease, associated with the presence of specific and unique molecular patterns [8]. This goes along with the current understanding that asthma is not a homogenous and uniform disease but rather, a syndrome to which different mechanisms may contribute in individuals and specific group of patients.

Interestingly, two candidate genes for asthma, *NPSR1* (chromosome 7p14.3) and *RORA* (chromosome 15q22.2), have recently been suggested to play a role in controlling circadian rhythm [9–11]. *NPSR1*, a G protein-coupled receptor, has been associated to asthma susceptibility in numerous studies [12–14], while also having been related to the circadian rhythm in mice and humans [9,15]. *RORA*, a nuclear hormone receptor, was associated with asthma [16,17] and its mRNA expression varies during human lung development and during murine lung inflammation [11,18–20]. Also, *RORA* is known to influence the circadian rhythm of various physiological processes [11,18–22]. Finally, it was recently suggested that *RORA* and *NPSR1* interact biologically by influencing promoter activity and each other's gene expression thereby modifying asthma risk concomitantly [23].

We hypothesized that through their effects on circadian rhythm and asthma, *RORA* and *NPSR1* would specifically influence nocturnal asthma. Thus, the aims of this study were (1) to

144 investigate whether gene-gene-interactions between *RORA* and *NPSR1* specifically affect the
145 occurrence of nocturnal asthma and (2) to differentiate these effects from asthma without
146 nocturnal symptoms or severe asthma.

MATERIALS AND METHODS

Study populations

As a discovery population in a case reference design we investigated participants from the Multicenter Asthma Genetic in Childhood study (MAGICS) and the cross-sectional International Study of Asthma and Allergies in Childhood phase II (ISAAC II) as previously described in the first GWAS on asthma (N=1,454) [24]. Replication was carried out in two population-based birth cohorts: BAMSE (Children Allergy Milieu Stockholm Epidemiology study; N=2,033) from Sweden and MAAS (Manchester Asthma and Allergy Study; N=1085) from the UK. Study populations have been described elsewhere [24–27]. The studies were approved by the respective ethics committees. Written informed consent was obtained from all parents.

Phenotypes

In MAGICS, asthma was diagnosed by a pediatric pulmonologist based on clinical presentation and objective measures including lung function and allergy tests. In ISAAC II and BAMSE, a parentally reported physician's diagnosis had to be present while in MAAS children with at least two out of three features [(1) Wheezing or whistling in the chest in the last 12 months; (2) Current use of asthma medication; (3) Physician-diagnosed asthma ever] were compared to children with 0/3 features.

Nocturnal asthma was defined as asthma plus parentally reported wheezing or gasping during the night at least once over the previous 12 months in MAGICS/ISAAC and MAAS. In BAMSE, asthma plus any coughing or breathing difficulties throughout the night sufficed. Due to this

slight disparity, phenotypes were denominated differently: *nocturnal asthma symptoms* (MAGICS/ISAAC and MAAS) and *nocturnal breathing difficulties* (BAMSE). In MAAS, phenotypes were also assessed at 16 years. Figure 1 displays the number of patients in each group. Subjects with neither asthma nor nocturnal symptoms served as controls in all cohorts.

Asthma severity is not unanimously defined and it was thus assessed differently in all cohorts: in MAGICS/ISAAC, the number of hospital, emergency department or doctor visits due to asthmatic symptoms was counted; in MAAS, the number of exacerbations over twelve months were counted; and in BAMSE, nighttime wheezing, the use of asthma medication and activity limitation were assessed. Asthma severity was assessed as a continuous variable within the asthmatic cases only.

Functional database scan

Functional databases (HaploReg, SNPinfo, SNiPA, ENCODE, Roadmap Epigenomics project, GRASP database) were systematically screened for functional relevance of associated SNPs. Sequence conservation analyses were based on SiPhy and GERP elements. Regulatory protein binding was obtained from the ENCODE ChIP-Seq data, epigenomic data from the Roadmap Epigenomics project and eQTL from GTEx and the GRASP database.
For study design, SNP selection and genotyping details please refer to the online supplement.

Statistical analysis

Associations of binary traits were evaluated by logistic regression, interactions were assessed using the --epistasis command and deviation from Hardy-Weinberg equilibrium was analyzed by chi-square test in the control group, all using PLINK 1.0.7 [28]. All further analyses were

194 performed with R software (3.0.1; http://www.r-project.org/). All markers were in HWE
195 (p>0.0001). Odds ratios (OR) and 95% confidence intervals (CI) are reported for dichotomous
196 variables and beta-values and standard errors (SE) for continuous variables. We present ORs
197 and beta-values instead of providing figures for every single interaction for a better readability
198 and clarity of the text. Linkage Disequilibrium (LD) plots were generated with Haploview [29].
199
200 Testing a specific hypothesis, *p*-values <0.05 were considered statistically significant for the
201 replication analyses. In order to account for multiple testing in *de novo* interaction analyses and
202 to minimize the risk of reporting false positive results, we only discuss polymorphisms for
203 which the number of significant interactions exceeded stochastic expectation, as suggested
204 previously [30]. More precisely, polymorphisms had to display at least three significant
205 interactions with SNPs from the respective other gene (24 SNPs*0.05=1.2 and 35
206 SNPs*0.05=1.75≈2 expected false positive results per SNP).

RESULTS

Interactions between *RORA* and *NPSR1* SNPs affect the risk for asthma

First, we investigated systematically if gene-gene-interactions between *RORA* and *NPSR1* affect asthma in our MAGICS/ISAAC population. For that we enriched the two gene loci with all SNPs previously associated with asthma, confirming and expanding a previous report by Acevedo, where a smaller number of SNPs were studied in the BAMSE and PARSIFAL cohorts [23]. Indeed, seven SNPs within *RORA* and eight *NPSR1*-SNPs were found to significantly contribute to interactions associated with asthma in MAGICS/ISAAC (Figure 2 and Supplementary Table S2). *RORA* rs12591848 interacted with eight SNPs in *NPSR1* [most strongly with rs1419779; OR(CI)=0.45(0.30-0.68); p=1.51*10^{-4}] and *NPSR1* rs963218 interacted with nine SNPs in *RORA* [most strongly with rs12591848; OR(CI)=0.51(0.35-0.74); p=4.60*10^{-4}]. Of these newly found interactions, we could replicate five interactions in our additional cohorts (including BAMSE where they were not originally reported) and six of the newly found interactions showed a trend towards significance in the replication cohorts. Especially the combination of rs2899662 and rs887020 affected asthma constantly across populations (Table 1 and Supplementary Table S3). Of note, only two combinations of SNPs in each gene were linked with an r^2>0.80 (see Supplementary Figures S3 and S4).

Interactions between *RORA* and *NPSR1* SNPs affect nocturnal asthma symptoms specifically

We then assessed epistasis effects on nocturnal asthma in our discovery population. Overall, twelve *RORA*-SNPs showed at least three significant interactions with SNPs in *NPSR1* in relation to nocturnal asthma. Six of these SNPs were only associated with nocturnal asthma,

and not with asthma *per se*. Within *NPSR1*, twelve SNPs showed at least three significant interactions with *RORA* when nocturnal asthma symptoms were the outcome. Seven of these SNPs seemed to represent genuine associations with nocturnal asthma, as they did not interact with *RORA*-SNPs to affect asthma *per se*. The strongest overall signals were noted for rs6972158 in *NPSR1* and rs7171681 in *RORA*, which each interacted significantly with at least ten SNPs from the respective other gene. The strongest single interaction affecting nocturnal asthma symptoms was found for *NPSR1* rs324396 and *RORA* rs7171681 [OR(CI)=0.45(0.28-0.73); p=0.0013] (see Figure 3 and Supplementary Table S5). Taken together, we concluded that indeed numerous gene by gene interactions between *RORA* and *NPSR1* exist and that these may affect nocturnal asthma.

Now we attempted to replicate the significant results with similar phenotypes in BAMSE and MAAS. Interestingly, we were able to replicate seven interactions in MAAS with six further interactions reaching borderline significance in one of the datasets. Of note, the effect direction was the same in the other replication dataset in most cases (Table 2 and Supplementary Table S6). Particularly the combination of rs324396*rs2899662 and rs13799228*rs4775292 affected nocturnal asthma strongly in all cohorts. To detect temporal continuity we assessed whether interaction effects at age 11 remained associated with nocturnal asthma at age 16 in MAAS. Intriguingly, two out of eleven interactions still affected nocturnal asthma significantly at age 16 (rs324396*rs2899662 and rs324396*rs341382) and four interactions reached borderline significance (Supplementary Table S7).

Finally, we rigorously prioritized associated SNPs based on the number of original interactions (interacting with ≥25% of the other gene's SNPs) and the number of replicated interactions (≥2

replications) to only include our main hits (N=10, see Supplementary Figure S5). Scanning various databases, we found that all but two of our top SNPs are predicted to have relevant functional impact (Table 3): While one SNP (rs6972158) results in a non-conservative amino acid change from glutamine to arginine in *NPSR1*, seven out of the remaining nine SNPs are tightly linked to SNPs predicted to be located in promoter regions and five SNPs alter transcription factor binding sites for various proteins known to play important roles in immunology and chronobiology [31,32]. In turn, 6 of these SNPs also lead to a differential gene expression in tested tissues. Of note, 3 of these SNPs are located in phylogenetically highly conserved regions.

RORA **and** ***NPSR1*** **interactions have minor effects on asthma without nocturnal symptoms**

Next, we analysed if *RORA* by *NPSR1* interactions affect asthmatics without nocturnal asthma symptoms. If *RORA* by *NPSR1* interactions were involved in a mechanism specific for nocturnal asthma, associations in asthmatics *without* nocturnal symptoms would be expected to be absent or much weaker than the ones found in asthmatics *with* nocturnal symptoms. Indeed, there were fewer interactions associated with the occurrence of asthma without nocturnal symptoms: only four *NPSR1*-SNPs interacted with ≥3 *RORA*-SNPs and only two *RORA*-SNPs interacted with ≥3 SNPs in *NPSR1*. The strongest interaction was noted for *NPSR1* rs323917* *RORA* rs17204454 [OR(CI)=0.29(0.13-0.61); p=0.0012]. We could replicate one interaction in BAMSE and most interactions had the same effect direction (Supplementary Tables S8 and S9). In comparison, as seen above, there was a total of 24 SNPs from both genes interacting with ≥3 SNPs from the respective other gene when asthma *with* nocturnal symptoms was the

outcome. Results of these analyses are displayed in a comparative manner in Figure 3. Of note, atopy status in asthmatics (71.8%) and nocturnal asthmatics (74.0%) was comparable.

Effects of *RORA* and *NPSR1* interactions on asthma severity

To further disentangle whether *RORA* and *NPSR1* specifically affect nocturnal asthma we also sought to describe the two genes' effects on asthma severity in our three populations, even though one has to be aware that severity definitions varied somewhat between these studies (as described in the methods section). This analysis was based on the assumption that the effects on nocturnal asthma may be influenced and/or partly explained by asthma severity. We could show that seven *RORA*-SNPs as well as nine *NPSR1*-SNPs interacted with ≥3 SNPs from the respective other gene to associate with asthma severity (Supplementary Figure S2). Overall, there were 52 significant interactions [strongest interaction rs2530547*rs4775289: ß(SE)=0.53(0.14), p=0.0002]. Some of these interactions had also affected nocturnal asthma, thus implying that their effect on nocturnal asthma and on asthma severity may be confounded. However, most interactions between *RORA* and *NPSR1* remained specific for nocturnal asthma. Lastly, four SNPs in *RORA* as well as three *NPSR1*-SNPs seemed to be only associated with asthma severity and not nocturnal asthma. However, when trying to replicate our results in the two independent cohorts, we found that almost no interaction had the same effect direction in both replication cohorts for severity, very much in contrast to our constant replications for nocturnal asthma across different cohorts (Supplementary Table S11).

DISCUSSION

This study deciphers a plausible genetic mechanism for nocturnal asthma by demonstrating that interactions between *RORA* and *NPSR1* are specifically associated with nocturnal asthma, suggesting the involvement of a genetic mechanism related to circadian rhythm control.

We replicated and extended recent observations that interactions between *RORA* and *NPSR1* increase the risk to develop asthma in three independent cohorts. By systematically enriching both *RORA* and *NPSR1* gene loci we identified a number of additional and novel gene-gene-interactions driving asthma. The most intriguing and novel result from our study, however, is that interactions between *RORA* and *NPSR1* strongly associate with nocturnal asthma, rather than asthma *per se*. There has been limited evidence for a genetic background of nocturnal asthma, all relating to the beta2 adrenoreceptor (ADRB2), coming from rather small datasets [33–35]. These studies followed the hypothesis that mutations in *ADRB2* increase airway constriction in asthmatics and reduce the response to treatment, thus increasing symptoms and severity, possibly even pronounced at night. Our study now shows a mechanism specific for nocturnal symptoms by deciphering molecular associations within genes of the circadian rhythm: As both genes under investigation have been independently associated with asthma susceptibility [12–14,16,23] and seem to play a role in defining the circadian rhythm [15,18], the observed associations are biologically plausible.

There are some limitations to our study: Firstly, it has to be acknowledged that this was a retrospective study design with questionnaire-based definitions of nocturnal symptoms as well as asthma severity. This may have led to an under-estimation of the number of nocturnal asthmatics, possibly indicated by the low number of nocturnal asthmatics in our study. This

may potentially have skewed the results. However, a failure to assign some of the nocturnal asthmatics to any respective group would normally lead to an under-estimation of the power of any found difference, thereby potentially even under-estimating the actual effect size. Secondly, we tested a number of independent associations, thus raising the issue of multiple testing. We tried to avoid false-positive results by focusing on polymorphisms for which the number of significant interactions exceeded the stochastic expectation [30]. Considering only SNPs that showed ≥3 interactions reduced (but did not exclude) the probability of obtaining false-positive results. For interaction analyses it is biologically plausible that SNPs would interact with several SNPs from the respective other gene if they have impact on function [23].

Intriguingly, we were able to replicate several interactions in MAAS even though replication of interaction analyses is only rarely achieved [36]. Replication analyses with the phenotype *nocturnal breathing difficulties* in BAMSE did not reach significance. This may partly be due to the difference in phenotypes: In MAGICS/ISAAC and MAAS, the phenotype was relatively specific for asthma as it asked for nocturnal wheezing or gasping. In BAMSE, however, parents were asked for general coughing and breathing difficulties at night which is less specific for asthma. This could also explain why in BAMSE 307 children showed nocturnal breathing difficulties without having asthma, while only 14 children in MAGICS/ISAAC and no child in MAAS reported nocturnal symptoms without an asthma diagnosis. However, even in BAMSE, effect directions were the same for almost all interactions. The constant replication and the extension to nocturnal asthma at age 16 in MAAS implies (1) that this is a mechanism specific for nocturnal asthma and (2) that this mechanism is stable over populations and over time. The stability of these findings is intriguing, as replication of interaction effects is difficult to achieve [36]. To find and replicate interactions despite our relatively small sample sizes of approximately

1,000-1,500 individuals in each dataset implies a strong effect size of these interactions, indeed indicated by relatively high odds ratios. A further strength of our study is the clinically defined asthma phenotype that was largely obtained by a pediatric pulmonologist rather than by parental report.

To assess whether these results are explained by the similarity between nocturnal asthma and severe asthma we compared *RORA* by *NPSR1* effects on asthma severity with our findings on nocturnal asthma. However, it has to be noted that this analysis was performed to differentiate nocturnal asthma from severe asthma and should only be interpreted in relation to nocturnal asthma results. We found that the two genes also interact in affecting asthma severity in MAGICS/ISAAC but could not replicate these results in MAAS or BAMSE. The inability to replicate results on this phenotype may be due to different definitions of asthma severity in the three datasets, reflecting the ambiguity of this phenotype. There are several clinical features that contribute to asthma severity, thus making it difficult to comprehensively investigate this phenotype. As nighttime awakenings are sometimes regarded as a feature of asthma severity, it is not yet understood to what extent nocturnal asthma is an independent phenotype. Thus, we sought to discriminate the effect of *RORA* and *NPSR1* on nocturnal asthma and on asthma severity. Based on our data it seems as if nocturnal asthma and asthma severity are related but distinct features of asthma. However, we cannot draw final conclusions due to our failed replications and the ambiguous phenotypes.

The NPS/NPSR1 system as well as *RORA* have been shown to play a role in circadian rhythm: *NPSR* knockout mice exhibited lower activity levels under light-dark conditions, NPS injections lead to an increased wakefulness and non-synonymous *NPSR1* rs324981 was

recently associated with a delay of bedtime and sleep duration [9,10,15]. *RORA* gene expression varies throughout the day and *Rora*-deficient mice showed a decreased activity and could not adjust to light-dark cycles [18,21,23]. Additionally, *RORA* modulates the rhythmic expression of downstream target genes, which were recently implicated in mast cell cytokine secretion [37] and lung epithelial chemokine production [38], thereby connecting circadian rhythm genes with immunological processes [11,18–22]. Interestingly, *NPSR1*-overexpressing cells demonstrated an increased mRNA expression of *RORA* and other circadian genes [23,39] and *in vivo Npsr1*-deficient mice showed a lower *RORA* mRNA expression [23]. Reversely, it was shown that *RORA* regulates *NPSR1* promoter activity [23]. Taken together, both *RORA* and *NPS/NPSR1* signalling appear to be interwoven when acting upon complex immune-related circadian outcomes, and in our case nocturnal asthma.

By systematically scanning online databases for functional relevance of our main hits we found that 8 out of 10 (or their proxy-SNPs in high LD) are predicted to have functional effects: rs6972158 is a missense SNP resulting in an amino-acid change from glutamine to arginine at position 344 of the isoform A of NPSR1. Gln344 is located within the cytosolic domain of the NPSR1 protein and hence, it could have an effect on intracellular signaling. Future *in vitro* studies should address whether allele specific effects of rs6972158 influence transcription rates of genes involved in the inflammatory response or the molecular clock in lung tissue.

Interestingly, seven out of the remaining nine SNPs are tightly linked to SNPs predicted to be located in promoter regions [40], and known to be binding sites for protein playing an important role in immunology and chronobiology: GATA3 induces IL-4, IL-5 and IL-13 secretion and is strongly involved in asthma susceptibility [32,41] and P300 is an important part of the circadian

clock [42]. Most interestingly, four of our investigated top hits were in tight relation to STAT3 gene expression or showed differential binding capabilities for this relevant transcription factor: Up-regulation of STAT3 is associated with lung inflammation as well as an altered cytokine profile in asthmatic patients [31]. Additionally, it is known to dynamically control Th2 and Th17 cell responses during allergic lung inflammation in mice and humans [31] while being rhythmically expressed and triggered by the endogenous clock [43]. Furthermore, *NPSR1* rs1379928, rs1419779 and rs6972158 as well as *RORA* rs2899662, rs4775301 and rs341382 have been shown to increase downstream gene expression while *RORA* rs2899662 and rs7171681 are linked to mono- or tri-methylated histone mark H3K4 in T-helper cells, thus promoting downstream gene expression [40]. Therefore, new starting points for functional genomic assessments have been identified.

All in all, major SNPs showing association in interaction analyses in this study seem to be highly relevant for lung inflammation and asthma susceptibility while at the same time being involved in the circadian rhythm by promoting gene expression differentially. However, to conclusively determine biological plausibility of the results, further prospective and mechanistic studies are needed. Thus, it might be worthwhile to study the influence of further circadian rhythm genes on nocturnal asthma, potentially also investigating mitigation by the sympathetic nervous system. Understanding the pathogenesis of nocturnal asthma could increase our clinical and causal knowledge of the disease, thus potentially impacting on improvements in management and care for the affected patients.

Taking all aspects into account, we conclude that *RORA* and *NPSR1* interactions are consistent and that these interactions are mainly associated with the development of nocturnal asthma, an

association which is not only statistically significant but biologically plausible due to the role of both genes in asthma and circadian rhythm. Our data implies that nocturnal asthma is no simple disease entity in the severity spectrum of the disease. Specific molecular patterns regulating the circadian clock, such as those studied here, are associated with nighttime symptoms. Further research could help to clarify mechanisms and introduce potential avenues of intervention in this subphenotype of asthma that is not well understood but highly troublesome for patients.

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FIGURES

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607

Nocturnal asthma is affected by genetic interactions between *RORA* and *NPSR1*

Gaertner et al.

TABLES

Table 1. Significant interaction results (*RORA* * *NPSR1*) on asthma in all cohorts.

Interaction on asthma [a]	MAGICS/ISAAC	MAAS	BAMSE
rs2899662 * rs887020	1.34 (1.06-1.7) **0.015**	1.46 (1.02-2.09) **0.0407**	1.41 (1.06-1.87) **0.018**
rs2899662 * rs963218	1.39 (1.1-1.75) **0.006**	1.29 (0.9-1.83) 0.162	1.33 (1.01-1.75) **0.045**
rs2899662 * rs324396	0.72 (0.55-0.93) **0.0135**	0.61 (0.41-0.92) **0.0166**	0.82 (0.61-1.1) 0.1836
rs8042149 * rs714588	1.27 (1.01-1.59) **0.041**	1.02 (0.72-1.45) 0.9143	1.58 (1.2-2.09) **0.0012**
rs4775301 * rs714588	1.29 (1.03-1.61) **0.025**	1.14 (0.8-1.63) 0.4583	1.39 (1.05-1.84) **0.020**
rs4775301 * rs324396	0.73 (0.57-0.93) **0.0116**	0.7 (0.48-1.02) *0.0605*	0.9 (0.67-1.2) 0.4701
rs12591848 [b] * rs2530547 [c]	0.54 (0.36-0.8) **0.0025**	0.81 (0.42-1.55) 0.5228	0.71 (0.48-1.06) *0.092*
rs12591848 [b] * rs963218	0.51 (0.35-0.74) **4.60e-04**	0.65 (0.36-1.18) 0.1603	0.71 (0.47-1.06) *0.090*
rs4775289 * rs963218	1.26 (1.01-1.58) **0.0428**	1.09 (0.78-1.52) 0.6272	1.3 (0.99-1.71) *0.058*
rs11071561 * rs727162	1.33 (1-1.76) **0.0471**	1.52 (0.99-2.33) *0.0557*	1.02 (0.73-1.43) 0.8856
rs7171681 * rs963218	1.39 (1.09-1.77) **0.0085**	1.01 (0.69-1.47) 0.9544	1.28 (0.98-1.69) *0.075*

Odds ratios, 95% confidence intervals and *p*-values are reported for all datasets. *P*-values of significant interactions are in bold letters and the background is marked green; borderline significant interactions are marked in olive green and *p*-values are in italic. [a] The interaction is shown in the following format: *RORA*-SNP * *NPSR1*-SNP. [b] rs12591848 was replaced by rs746241 in BAMSE (SNPs are reported to be in perfect LD). [c] This interaction was significant in the recent paper by Acevedo et al [23] using BAMSE and PARSIFAL populations. Looking only at the BAMSE cohort the interaction is less powerful and therefore, does not reach statistical significance.

Table 2. Replication of interaction effects between *RORA* and *NPSR1* on nocturnal asthma symptoms.

Interaction [a]	NAS [b] (MAGICS/ISAAC)	NAS [b] (MAAS)	NBD [b] (BAMSE)
rs1379928 * rs4775292	1.68 (1.08-2.6) **0.02**	2.11 (1.16-3.84) **0.0143**	1.23 (0.76-1.97) 0.3974
rs1379928 * rs12437690	0.62 (0.39-0.97) **0.036**	0.53 (0.3-0.93) **0.0254**	0.86 (0.54-1.37) 0.5355
rs1379928 * rs17204454	1.59 (1.04-2.43) **0.0318**	1.99 (1.14-3.46) **0.0149**	1.11 (0.71-1.75) 0.644
rs324384 * rs2899662	0.65 (0.44-0.96) **0.0317**	0.6 (0.36-0.98) **0.0395**	0.97 (0.67-1.41) 0.8682
rs324957 * rs2899662	0.65 (0.44-0.96) **0.032**	0.56 (0.34-0.91) **0.02**	na
rs324396 * rs2899662	0.61 (0.4-0.95) **0.0277**	0.48 (0.28-0.82) **0.0069**	0.73 (0.49-1.1) 0.1309
rs324396 * rs7171681	0.45 (0.28-0.73) **0.0013**	0.54 (0.3-0.99) **0.0459**	0.82 (0.54-1.24) 0.3384
rs324396 * rs341382	0.52 (0.32-0.85) **0.0094**	0.58 (0.31-1.07) *0.0825*	0.9 (0.58-1.4) 0.649
rs324396 * rs4775301	0.65 (0.44-0.96) **0.0307**	0.63 (0.38-1.03) *0.065*	0.87 (0.6-1.28) 0.4886
rs2609234 * rs341382	1.74 (1.03-2.93) **0.0376**	1.88 (0.96-3.7) *0.0675*	na
rs963218 * rs12591848 [c]	0.46 (0.25-0.84) **0.0108**	0.77 (0.37-1.6) 0.4834	0.6 (0.35-1.05) *0.0759*
rs324981 * rs11071561	1.51 (1.07-2.13) **0.02**	1.57 (0.99-2.5) *0.0577*	na
rs740347 * rs4775289	1.67 (1.02-2.73) **0.041**	1.03 (0.56-1.92) 0.9164	1.65 (0.97-2.8) *0.0646*

[a] The interaction is shown in the following format: *NPSR1*-SNP * *RORA*-SNP. [b] NAS = nocturnal asthma symptoms; NBD = nocturnal breathing difficulties. [c] rs12591848 was replaced by rs746241 in BAMSE (SNPs are reported to be in perfect LD). Odds ratios, 95% confidence intervals and *p*-values are reported for all datasets, *p*-values of significant interactions are in bold letters and green background, borderline significant *p*-values are marked in italic and cells are shaded olive green. na = interaction could not be calculated as at least one of the SNPs was not available in the BAMSE cohort.

Table 3A. Functional relevance of selected top hits in *NPSR1* interacting to be associated with nocturnal asthma symptoms.

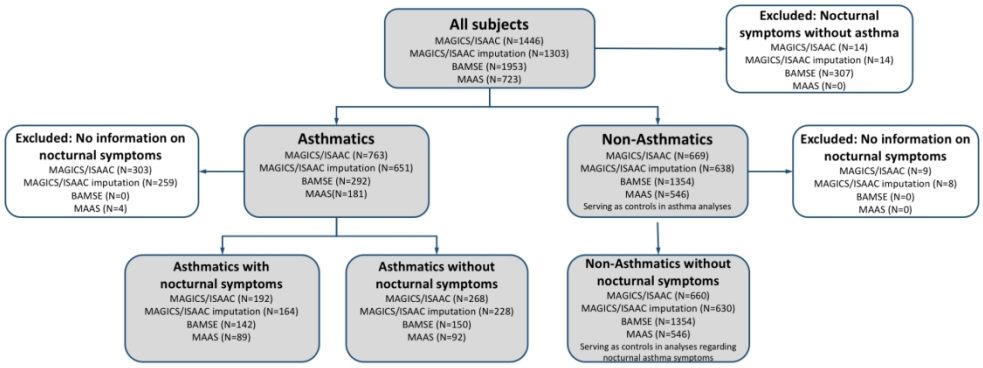
SNP	Gene	N IA	N IA replicated	Location	Predicted promoter region?	SNP conserved	eQTL	TFBS
rs1379928	*NPSR1*	9	3	Intron	BRN (LD 0.88)	LD (0.99)	gene expression change of *ABCA7*, *GNB2L1*, *SLC4A2* in PBMC (LD 0.92)	CFOS,STAT3,P300 (LD 0.81)
rs324396	*NPSR1*	5	2 (4)	Intron NPSR1 / exon NCAPD2P1	LNG, CRVX, LIV (LD 0.98)	--	--	26 proteins, e.g. GATA3 and STAT3 (LD 0.98)
rs6972158	*NPSR1*	10	0	Missense / Splicing site	--	yes	eQTL of *NPSR1* in Testis (LD 0.8)	--
rs1419779	*NPSR1*	9	0	Intron	GI, PANC, LIV (LD 0.99)	--	gene expression change of *DPY19L1* in blood	MAFF, MAFK (LD 0.99)

Table 3B. Functional relevance of selected top hits in *RORA* interacting to be associated with nocturnal asthma symptoms.

SNP	Gene	N IA	N IA replicated	Location	Predicted promoter region?	SNP conserved	eQTL	TFBS
rs2899662	*RORA*	5	3	Intron	BLD, MUS (LD 0.95)	--	differential exon level expression of *RORA* in brain cortex	USF1 (LD 0.85)
rs7171681	*RORA*	11	1	Intron	BLD	LD (0.97)	--	STAT3 (LD 0.98)
rs4775301	*RORA*	8	0 (1)	Intron	BLD (LD 0.82)	--	*CTCF*, *NRSF* (LD 0.82)	--
rs8042149	*RORA*	8	0	Intron	--	--	--	--
rs4775289	*RORA*	7	0 (1)	Intron	--	--	--	--
rs341382	*RORA*	6	0 (2)	Intron	ESC, BLD (LD 0.95)	--	*STAT3* (LD 0.97)	--

Information was obtained from several databases as indicated in the methods section. All SNPs interacting with at least 25% of the other gene's SNPs in the discovery cohort or with at least two significant replications were included (N=10). If a SNP in LD was associated with a functional change, 'LD' and the respective r^2 value is put in brackets. The count of replicated interactions includes the replications with a $p<0.05$ and the replications with borderline significance ($p<0.10$) in brackets. Predicted promoter region is reported if the SNP was predicted to be located in a promoter region in a selected tissue. For an exact explanation of the columns please refer to the methods section. Part A includes SNPs from *NPSR1* and Part B includes SNPs from *RORA*.

Abbreviations: N – number, IA – Interaction, eQTL – expression quantitative trait loci, TFBS – Transcription Factor Binding Site, LD – Linkage Disequilibrium, LIV – Liver, BRN – Brain, LNG – Lung, CRVX – Cervix, GI – Gastrointestinal Tract, PANC – Pancreas, BLD – Blood, MUS – Muscle, PBMC – peripheral blood monocytes.



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166x65mm (300 x 300 DPI)

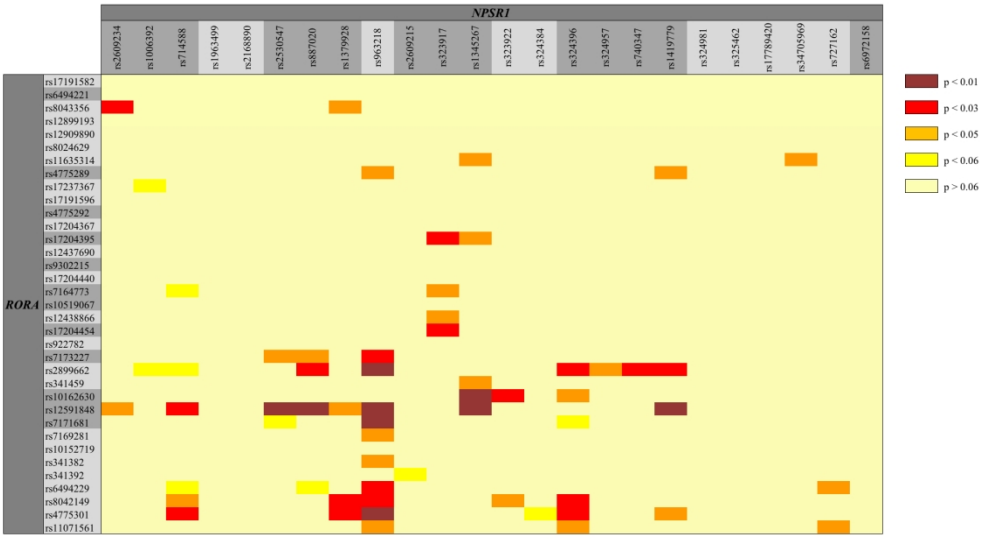
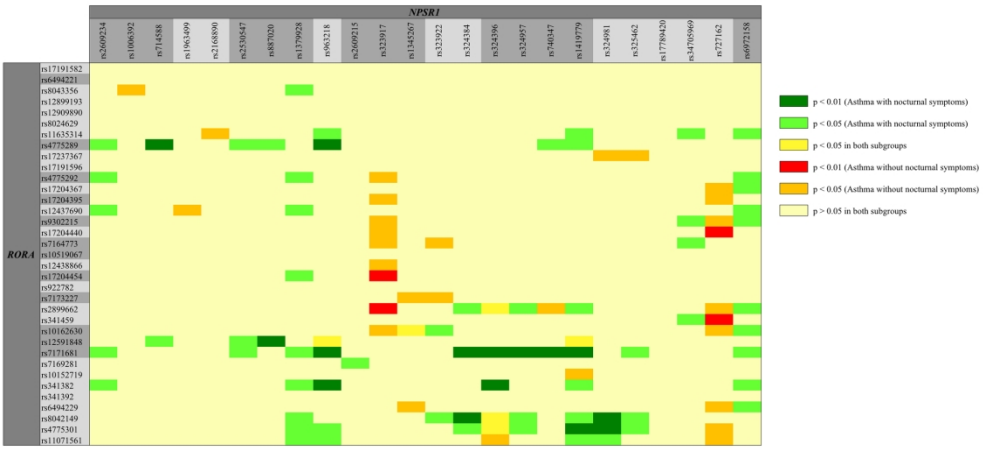


Figure 2. Heat map of the interaction results of RORA*NPSR1 on asthma in MAGICS/ISAAC. Color explanation to the right. Darker colors indicate stronger associations. SNPs obtained from the regular GWAS dataset are highlighted in dark grey, imputed SNPs are highlighted in light grey.

161x88mm (300 x 300 DPI)



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190x85mm (300 x 300 DPI)

Nocturnal asthma is affected by genetic interactions between *RORA* and *NPSR1*

Gaertner et al.

FIGURES

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Nocturnal asthma is affected by genetic interactions between *RORA* and *NPSR1*

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ONLINE SUPPLEMENT

Participant flow

In MAGICS/ISAAC, we excluded 8 subjects with no asthma diagnosis and 14 subjects with reported nocturnal symptoms but no diagnosed asthma, thus leaving 1,432 subjects for analysis. In BAMSE, 80 subjects without information on asthma diagnosis and 307 subjects with reported nocturnal symptoms but no diagnosed asthma were excluded, thus leaving 1,646 subjects for analyses. In MAAS, children with only one or two of the three features used to differentiate asthmatics and controls were excluded from further analyses, leaving 723 children in this study. For a more detailed description of all cohorts, please see Figure 1 and Supplementary Table S1.

SNP selection

Since both genes under review are relatively large, SNPs were selected for analysis according to a stringent and conservative approach. Firstly, we included all SNPs from both genes that had been selected in a recent study on the interaction of *RORA* and *NPSR1* [1]. Based on a stringent literature search we then added SNPs that had been reported to be associated with asthma but were not covered by the aforementioned study (the search was performed on April 28th 2018 and the search terms were "asthma[Title] AND GPRA [All Fields] AND polymorphism [All Fields]" and "asthma[Title] AND NPSR1 [All Fields] AND polymorphism [All Fields]" and "asthma[Title] AND RORA [All Fields] AND polymorphism [All Fields]"). SNPs included in the analyses were obtained from the following studies: [2–11]. The SNP selection is depicted in Supplementary Figure S1. In total, 59 SNPs were selected. Of these, 22 SNPs had been originally genotyped in our GWAS dataset [12]. We then selected SNPs in perfect LD (r^2=1) with one of the SNPs under consideration (N=4; based on a search in SnapProxy with 1000Genomes data as reference panel). For the remaining 33 SNPs we used imputation data on the basis of the 1000Genomes dataset as described below.

Genotyping and imputation

Genotyping was performed by using the Illumina Sentrix HumanHap300 BeadChip for MAGICS/ISAAC (imputation data was used when no original genotyping information was available) [12,13]. The iPLEX chemistry and the SEQUENOM platform at the Mutation Analysis Facility at Karolinska Institutet (BAMSE) and the Illumina 610 quad and subsequent imputation with the 1000 Genomes Phase 3 reference genome (MAAS) were used for the replication cohorts.

46

SUPPORTING FILES

Supplementary Figure S1. Schematic depiction of the SNP selection process. SNPs marked with an asterisk either showed no association with asthma or were already included in the publication by Acevedo et al.

Supplementary Figure S2. Heat map of the interaction results of *RORA*NPSR1* on asthma with nocturnal symptoms and on asthma severity in MAGICS/ISAAC. Color coding is explained on the right. Green colors indicate a significant interaction when asthma with nocturnal symptoms was the outcome whereas blue colors indicate a significant interaction when severe asthma was the outcome. Cells in turquoise mark interactions which significantly influenced both outcomes. Darker colors indicate a stronger association. SNPs obtained from the regular GWAS dataset are highlighted in dark grey, imputed SNPs are highlighted in light grey.

Supplementary Figure S3. Linkage disequilibrium (LD) plot from the selected region from *NPSR1* within MAGICS/ISAAC. R^2-values are depicted and darker shades indicate a higher LD. The localization of all analyzed SNPs is depicted above the LD structure. Exons, introns, and the 5' untranslated region (UTR) are highlighted.

Supplementary Figure S4. Linkage disequilibrium (LD) plot from the selected region from *RORA* within MAGICS/ISAAC. R^2-values are depicted and darker shades indicate a higher LD. The localization of all analyzed SNPs is depicted above the LD structure. Exons, introns, and the 5' untranslated region (UTR) are highlighted.

Supplementary Figure S5. SNP selection for the functional database search.

* = with at least three SNPs from the respective other gene; # = one of these SNPs is already included in the other selection (thus, the overall number of selected SNPs is 10).

Supplementary Table S1. Descriptive characterization of the study populations. The characteristics of the regular dataset and the imputation dataset of the MAGICS/ISAAC cohort as well as the BAMSE and MAAS cohorts with all genotyped individuals included in the analysis are depicted for comparison. For MAAS, age is depicted for the visit closest to 11 years which was mainly used in this manuscript. Different definitions of the two phenotypes over the cohorts are discussed in the main text. *n = number affected/ number with data available. † BAMSE is a cohort study and all samples were collected when the individuals reached age 8 years. Abbreviations: SD - standard deviation.

Supplementary Table S2. Interaction results of *RORA* * *NPSR1*-SNPs on asthma in MAGICS/ISAAC. Interaction results of *RORA* by *NPSR1* on asthma within MAGICS/ISAAC are depicted. Originally genotyped SNPs are marked in dark grey whereas imputed SNPs are marked in light grey. Odds ratios, 95 % confidence intervals and *p*-values are reported for both publications. Each cell contains the results of the respective interaction in the format "OR (95% CI) p-value". *p*-values of significant interactions are marked in bold letters.

Supplementary Table S3. Complete replication results of *RORA*NPSR1* interactions on asthma in BAMSE and MAAS. All SNPs with at least 3 significant interactions in the original cohort and their respective replication results in BAMSE and MAAS are shown. Interactions between *RORA* and *NPSR1* with the same effect direction in the replication dataset as in MAGICS/ISAAC are marked in shades of green, opposing effect directions are marked in shades of red. The darker the color the stronger the association. Odds ratios with 95% confidence intervals and *p*-values are depicted. Each cell contains the results of the respective interaction in the format "OR (95% CI) p-value".

Supplementary Table S4. Direct association of SNPs in *RORA* and *NPSR1* with nocturnal asthma symptoms in MAGICS/ISAAC. Results for logistic regression of 59 SNPs on nocturnal asthma symptoms with age and sex as covariates. Non-asthmatic subjects with nocturnal symptoms were excluded for both analyses. Odds Ratios, 95% confidence intervals and *p*-values are reported for each SNP. Significant *p*-values are indicated in bold. Abbreviations: Chr – Chromosome; Position – chromosomal position; SNP – single nucleotide polymorphism; MAF – minor allele frequency; OR – odds ratio; CI – confidence interval; Chip – Illumina BeadChip genotyping; MALDI - MALDI-TOF-MS genotyping.

Supplementary Table S5. Interaction results of *RORA* * *NPSR1*-SNPs on asthma with nocturnal symptoms in MAGICS/ISAAC. Interaction results of *RORA* by *NPSR1* after stratification. Subjects with asthma as well as nocturnal symptoms (N=164 in the imputation dataset; N=192 in the regular dataset) were compared with non-asthmatics (N=630 in the imputation dataset; N=660 in the regular dataset) within MAGICS/ISAAC. SNPs from *RORA* are on the vertical axis while SNPs from *NPSR1* are depicted horizontally. Originally

genotyped SNPs are marked in dark grey whereas imputed SNPs are marked in light grey. Odds ratios, 95 % confidence intervals and *p*-values reported for both publications. Each cell contains the results of the respective interaction in the format "OR (95% CI) p-value". *p*-values of significant interactions are marked in bold letters.

Supplementary Table S6. Complete replication results of *RORA*NPSR1* interactions on nocturnal asthma in BAMSE and MAAS. All SNPs with at least 3 significant interactions in the original cohort and their respective replication results in BAMSE and MAAS are shown. Interactions between *RORA* and *NPSR1* with the same effect direction in the replication dataset as in MAGICS/ISAAC are marked in shades of green, opposing effect directions are marked in shades of red. The darker the color the stronger the association. Odds ratios with 95% confidence intervals and *p*-values are shown. Results of the respective interactions are depicted in the format "OR (95% CI) p-value".

Supplementary Table S7. Validation of *RORA*NPSR1* interaction results on nocturnal asthma in MAAS at age 16. Interaction effects of *RORA* and *NPSR1* on nocturnal asthma at age 16 for all interactions with at least borderline significant effects on nocturnal asthma at age 11 are shown. Interactions between *RORA* and *NPSR1* with the same effect direction at age 16 as at age 11 are marked in shades of green, opposing effect directions are marked in shades of red. The darker the color the stronger the association. Odds ratios with 95% confidence intervals and *p*-values are shown. Results of the respective interaction are depicted in the format "OR (95% CI) p-value".

Supplementary Table S8. Interaction results of *RORA* * *NPSR1*-SNPs on asthma without nocturnal symptoms in MAGICS/ISAAC. Interaction results of *RORA* by *NPSR1* after stratification. Subjects with asthma but without nocturnal symptoms (N=228 in the imputation dataset; N=268 in the regular dataset) were compared with non-asthmatics (N=630 in the imputation dataset; N=660 in the regular dataset) in MAGICS/ISAAC. SNPs from *RORA* are on the vertical axis while SNPs from *NPSR1* are depicted horizontally. Originally genotyped SNPs are marked in dark grey whereas imputed SNPs are marked in light grey. Odds ratios, 95 % confidence intervals and *p*-values reported for both publications. Each cell contains the results of the respective interaction in the format "OR (95% CI) p-value". *p*-values of significant interactions are marked in bold letters.

Supplementary Table S9. Complete replication results of *RORA*NPSR1* interactions on asthma without nocturnal symptoms in BAMSE and MAAS. All SNPs with at least 3 significant interactions in the original cohort and their respective replication results in BAMSE and MAAS are shown. Interactions between *RORA* and *NPSR1* with the same effect direction in the replication dataset as in MAGICS/ISAAC are marked in shades of green, opposing effect directions are marked in shades of red. The darker the color the stronger the association. Odds ratios with 95% confidence intervals and *p*-values are shown. Results of the respective interactions are depicted in the format "OR (95% CI) p-value".

Supplementary Table S10. Interaction results of *RORA* * *NPSR1*-SNPs on severe asthma in MAGICS/ISAAC. Interaction results of *RORA* by *NPSR1* on asthma severity. SNPs from *RORA* are on the vertical axis while SNPs from *NPSR1* are depicted horizontally. Originally genotyped SNPs are marked in dark grey whereas imputed SNPs are marked in light grey.

Odds ratios, 95 % confidence intervals and *p*-values reported for both publications. Each cell contains the results of the respective interaction in the format "OR (95% CI) p-value". *p*-values of significant interactions are marked in bold letters.

Supplementary Table S11. Complete replication results of interaction effects between RORA and NPSR1 on asthma severity. All SNPs with at least 3 significant interactions in the original cohort and their respective replication results in BAMSE and MAAS are shown. Interactions between *RORA* and *NPSR1* with the same effect direction in the replication dataset as in MAGICS/ISAAC are marked in shades of green, opposing effect directions are marked in shades of red. The darker the color the stronger the association. Estimates, standard errors and *p*-values are reported for all datasets, *p*-values of significant interactions are in bold letters. na = interaction could not be calculated as at least one of the SNPs was not available in the BAMSE cohort.

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234

Supplementary Table S1. Descriptive characterization of the study populations.

Parameter	MAGICS/ISAAC	MAGICS/ISAAC imputation dataset	MAAS	BAMSE
Male sex, n* (%)	838/1432 (58.5)	746/1289 (57.9)	382/723 (52.8)	1051/2033 (51.7)
Age (years), mean (SD)	10.3 (2.2)	10.3 (2.1)	11.5 (0.5)	8†
Asthmatics, n* (%)	763/1432 (53.3)	651/1289 (50.5)	177/723 (24.5)	292/1646 (17.7)
Nocturnal asthmatics / nocturnal breathing difficulties, n* (%)	192/1120 (17.1)	164/1022 (16.1)	89/635 (14.0)	142/1646 (8.6)

Supplementary Table S2. Interaction results of RORA * NPSR1-SNPs on asthma in MAGICS/ISAAC.

	NPSR1							
RORA	rs2609234	rs1006392	rs714588	rs1963499	rs2168890	rs2530547	rs887020	rs1379928
rs17191582	0.82 (0.54-1.27) 0.3767	0.98 (0.72-1.35) 0.9219	1 (0.73-1.36) 0.98	0.94 (0.54-1.62) 0.8241	0.84 (0.52-1.37) 0.4973	0.82 (0.59-1.16) 0.2615	0.93 (0.68-1.27) 0.6453	0.75 (0.52-1.09) 0.1311
rs6494221	0.94 (0.65-1.38) 0.7691	0.82 (0.62-1.1) 0.1883	0.99 (0.75-1.3) 0.9191	0.9 (0.56-1.45) 0.6553	0.8 (0.53-1.22) 0.2962	0.93 (0.69-1.25) 0.6195	0.96 (0.72-1.28) 0.7661	0.86 (0.63-1.18) 0.3602
rs8043356	0.57 (0.36-0.91) **0.0192**	0.9 (0.64-1.28) 0.5659	1.03 (0.73-1.45) 0.8693	0.92 (0.53-1.61) 0.7716	0.78 (0.47-1.3) 0.3415	1.2 (0.83-1.72) 0.3343	0.84 (0.59-1.19) 0.3204	0.67 (0.45-1) **0.0484**
rs12899193	0.76 (0.55-1.05) 0.0935	0.96 (0.75-1.22) 0.7242	0.98 (0.77-1.25) 0.8711	0.93 (0.61-1.42) 0.7332	0.86 (0.6-1.24) 0.4161	0.99 (0.76-1.29) 0.9403	0.93 (0.73-1.19) 0.5649	0.77 (0.58-1.02) 0.0637
rs12909890	0.9 (0.66-1.24) 0.5287	1 (0.82-1.23) 0.9845	0.94 (0.75-1.2) 0.639	1.05 (0.7-1.57) 0.8271	0.96 (0.67-1.38) 0.8314	1 (1-1) 0.9999	1 (0.79-1.26) 0.9932	0.87 (0.65-1.16) 0.3474
rs8024629	0.98 (0.65-1.48) 0.9338	0.95 (0.71-1.28) 0.7549	0.91 (0.68-1.22) 0.5313	1.07 (0.64-1.81) 0.7851	0.97 (0.61-1.53) 0.8981	0.92 (0.67-1.26) 0.5977	0.99 (0.74-1.34) 0.9649	1.01 (0.72-1.42) 0.9589
rs11635314	0.79 (0.5-1.23) 0.2961	1.3 (0.92-1.84) 0.1358	0.91 (0.66-1.26) 0.5729	0.79 (0.44-1.41) 0.4263	0.79 (0.47-1.33) 0.3793	0.85 (0.6-1.21) 0.3679	0.79 (0.57-1.11) 0.1738	0.87 (0.59-1.29) 0.4987
rs4775289	1.25 (0.91-1.71) 0.1624	0.97 (0.76-1.22) 0.7801	1.22 (0.97-1.54) 0.0848	1.07 (0.73-1.58) 0.7211	0.99 (0.7-1.39) 0.9396	1.13 (0.89-1.44) 0.3212	1.21 (0.96-1.53) 0.1086	1.11 (0.85-1.46) 0.4525
rs17237367	0.99 (0.69-1.41) 0.9481	0.77 (0.59-1) 0.0544	0.89 (0.68-1.15) 0.3699	0.76 (0.48-1.18) 0.2199	0.85 (0.57-1.28) 0.439	0.98 (0.74-1.29) 0.8717	0.98 (0.75-1.28) 0.8533	1.02 (0.74-1.4) 0.9033
rs17191596	0.92 (0.57-1.48) 0.7214	1.02 (0.72-1.45) 0.8989	0.9 (0.64-1.26) 0.5318	1.02 (0.56-1.88) 0.9389	1.06 (0.62-1.82) 0.82	0.9 (0.61-1.32) 0.594	0.87 (0.62-1.22) 0.4176	0.92 (0.62-1.38) 0.7006
rs4775292	1.2 (0.88-1.65) 0.2511	0.92 (0.72-1.17) 0.4791	1.2 (0.95-1.52) 0.1187	0.87 (0.59-1.27) 0.4571	0.83 (0.6-1.16) 0.2779	1.06 (0.82-1.35) 0.6659	1.21 (0.96-1.54) 0.1107	1.19 (0.92-1.55) 0.1901
rs17204367	0.88 (0.65-1.19) 0.4111	1.01 (0.8-1.27) 0.9457	0.88 (0.7-1.1) 0.2452	1.07 (0.72-1.58) 0.7308	1.12 (0.79-1.58) 0.5198	0.96 (0.75-1.23) 0.7717	0.87 (0.69-1.1) 0.2474	0.96 (0.74-1.26) 0.787
rs17204395	1.08 (0.73-1.6) 0.7033	1.08 (0.8-1.46) 0.6128	0.92 (0.69-1.23) 0.5813	1.22 (0.74-2) 0.4294	1.35 (0.87-2.08) 0.1785	1.1 (0.81-1.5) 0.5294	1.15 (0.87-1.51) 0.3385	1.08 (0.78-1.5) 0.6454
rs12437690	0.77 (0.57-1.04) 0.0878	1.13 (0.9-1.41) 0.2942	0.83 (0.67-1.03) 0.0959	0.8 (0.55-1.18) 0.2673	0.86 (0.62-1.21) 0.3928	0.94 (0.74-1.18) 0.5823	0.9 (0.72-1.11) 0.3205	0.84 (0.65-1.1) 0.2026
rs9302215	0.95 (0.69-1.32) 0.7762	1.11 (0.87-1.41) 0.4107	0.91 (0.72-1.15) 0.4431	0.85 (0.56-1.27) 0.4184	0.9 (0.63-1.28) 0.5567	0.83 (0.65-1.07) 0.1491	0.89 (0.7-1.13) 0.3324	0.91 (0.7-1.19) 0.5006
rs17204440	0.89 (0.67-1.18) 0.4168	1.16 (0.93-1.45) 0.1973	0.88 (0.71-1.09) 0.2356	1.01 (0.69-1.46) 0.9749	1.06 (0.77-1.47) 0.7138	0.92 (0.73-1.16) 0.5008	0.92 (0.73-1.15) 0.4507	0.89 (0.69-1.15) 0.3668
rs7164773	1.21 (0.88-1.65) 0.2454	1 (0.78-1.29) 0.9688	1.24 (0.99-1.54) 0.058	1.04 (0.71-1.53) 0.8334	1.05 (0.75-1.48) 0.7645	1.07 (0.84-1.35) 0.596	1.14 (0.91-1.43) 0.2411	1.23 (0.96-1.59) 0.1067
rs10519067	1.13 (0.71-1.78) 0.6091	1.03 (0.72-1.48) 0.8585	1.11 (0.79-1.57) 0.5411	1.24 (0.71-2.15) 0.4453	1.28 (0.78-2.08) 0.3301	0.96 (0.67-1.39) 0.8348	1.05 (0.76-1.47) 0.7602	0.96 (0.64-1.44) 0.8512
rs12438866	1.01 (0.75-1.35) 0.9578	1.1 (0.88-1.39) 0.4088	0.97 (0.77-1.21) 0.7672	1.09 (0.75-1.59) 0.6468	1.21 (0.87-1.68) 0.2544	1.06 (0.83-1.35) 0.6343	1.03 (0.82-1.28) 0.8212	1 (0.8-1.26) 0.9862
rs17204454	1.2 (0.89-1.62) 0.239	0.84 (0.66-1.05) 0.1312	1.17 (0.93-1.46) 0.1728	1.02 (0.7-1.48) 0.9206	0.97 (0.7-1.34) 0.8699	1.16 (0.92-1.48) 0.2104	1.12 (0.9-1.39) 0.3227	1.23 (0.96-1.59) 0.1027
rs922782	1.1 (0.82-1.47) 0.5437	1.1 (0.88-1.38) 0.3974	1.03 (0.83-1.28) 0.7965	0.73 (0.49-1.09) 0.1221	0.86 (0.61-1.21) 0.3736	1.06 (0.84-1.35) 0.6098	1.12 (0.9-1.39) 0.3259	1.18 (0.9-1.54) 0.2299
rs7173227	0.66 (0.42-1.05) 0.078	1.38 (0.98-1.94) 0.0676	0.77 (0.56-1.06) 0.1086	0.98 (0.6-1.61) 0.9514	0.83 (0.52-1.34) 0.4511	0.7 (0.5-0.99) **0.0446**	0.71 (0.51-0.98) **0.0397**	0.76 (0.51-1.11) 0.1539
rs2899662	1.22 (0.9-1.64) 0.1962	0.79 (0.62-1.01) 0.0599	1.25 (0.99-1.56) 0.0584	0.96 (0.64-1.42) 0.821	0.95 (0.67-1.34) 0.7508	1.23 (0.97-1.57) 0.0926	1.34 (1.06-1.7) **0.0149**	1.23 (0.94-1.61) 0.1308
rs341459	1 (0.73-1.38) 0.9805	1.12 (0.87-1.42) 0.3793	0.86 (0.68-1.1) 0.2266	0.85 (0.56-1.29) 0.4461	0.97 (0.68-1.4) 0.8868	0.9 (0.7-1.16) 0.4189	0.95 (0.76-1.21) 0.6947	1.05 (0.8-1.4) 0.7089
rs10162630	1.13 (0.83-1.54) 0.4544	1.16 (0.91-1.47) 0.2429	0.97 (0.77-1.23) 0.8125	1.03 (0.7-1.51) 0.8962	1.15 (0.82-1.61) 0.4308	0.87 (0.68-1.12) 0.2866	0.96 (0.76-1.21) 0.7097	0.99 (0.76-1.29) 0.9319
rs12591848	0.58 (0.34-0.99) **0.0458**	1.25 (0.84-1.86) 0.264	0.63 (0.43-0.92) **0.0178**	0.84 (0.45-1.56) 0.5815	0.66 (0.37-1.18) 0.1625	0.54 (0.36-0.8) **0.0025**	0.54 (0.36-0.8) **0.0019**	0.64 (0.41-0.99) **0.0442**
rs7171681	1.26 (0.91-1.76) 0.1685	0.88 (0.68-1.13) 0.316	1.22 (0.95-1.56) 0.1271	1.11 (0.75-1.66) 0.5936	1.03 (0.72-1.47) 0.8624	1.3 (0.99-1.69) 0.0546	1.18 (0.92-1.52) 0.189	1.27 (0.96-1.68) 0.0938
rs7169281	0.87 (0.66-1.16) 0.3391	1.07 (0.85-1.34) 0.5726	0.83 (0.67-1.03) 0.0877	0.88 (0.62-1.25) 0.4764	0.95 (0.69-1.3) 0.7314	0.88 (0.7-1.12) 0.3021	0.87 (0.7-1.08) 0.2058	0.86 (0.66-1.11) 0.2456
rs10152719	0.85 (0.57-1.28) 0.4449	1.06 (0.78-1.44) 0.7003	1.07 (0.8-1.43) 0.6427	1.11 (0.67-1.84) 0.6978	1.27 (0.81-1.98) 0.3021	1.06 (0.78-1.44) 0.6904	1.01 (0.76-1.34) 0.9339	0.88 (0.61-1.27) 0.4962
rs341382	1.21 (0.89-1.66) 0.2267	0.87 (0.68-1.12) 0.2925	1.2 (0.94-1.54) 0.1508	1.05 (0.7-1.58) 0.7958	0.95 (0.66-1.37) 0.7785	1.11 (0.85-1.44) 0.4509	1.23 (0.95-1.58) 0.1114	1.2 (0.9-1.61) 0.2136
rs341392	1.06 (0.76-1.5) 0.7226	1 (0.77-1.31) 0.9703	1.19 (0.91-1.56) 0.1984	1.14 (0.74-1.77) 0.5488	1.24 (0.84-1.84) 0.2793	1.15 (0.87-1.52) 0.3255	1.1 (0.85-1.43) 0.4554	1.05 (0.77-1.44) 0.7575
rs6494229	1.1 (0.81-1.48) 0.5437	0.9 (0.71-1.13) 0.3656	1.25 (1-1.56) 0.0512	1.2 (0.83-1.72) 0.3391	1.13 (0.81-1.59) 0.4628	1.24 (0.98-1.58) 0.0748	1.24 (1-1.55) 0.0522	1.12 (0.86-1.47) 0.3932
rs8042149	1.3 (0.98-1.73) 0.0738	1.04 (0.82-1.32) 0.7321	1.27 (1.01-1.59) **0.0407**	1.17 (0.81-1.68) 0.4122	1.08 (0.78-1.5) 0.6487	1.14 (0.9-1.46) 0.2797	1.16 (0.92-1.47) 0.1965	1.38 (1.07-1.8) **0.0143**
rs4775301	1.3 (0.98-1.73) 0.0663	0.95 (0.76-1.2) 0.6957	1.29 (1.03-1.61) **0.0248**	1.16 (0.8-1.67) 0.4337	1.12 (0.8-1.55) 0.5152	1.17 (0.92-1.49) 0.2136	1.2 (0.96-1.51) 0.1116	1.34 (1.03-1.74) **0.0276**
rs11071561	1.16 (0.87-1.54) 0.3229	0.96 (0.75-1.21) 0.7077	1.2 (0.96-1.52) 0.1148	1.21 (0.83-1.77) 0.3254	1.09 (0.77-1.54) 0.6182	1.1 (0.86-1.41) 0.4277	1.16 (0.92-1.47) 0.2087	1.22 (0.93-1.59) 0.1518

	NPSR1							
RORA	rs963218	rs2609215	rs323917	rs1345267	rs323922	rs324384	rs324396	rs324957
rs17191582	0.88 (0.65-1.2) 0.415	0.66 (0.37-1.18) 0.1647	0.67 (0.34-1.33) 0.2493	1.13 (0.83-1.54) 0.4479	1.09 (0.8-1.49) 0.5902	0.83 (0.6-1.14) 0.2409	0.99 (0.71-1.38) 0.9476	0.84 (0.61-1.17) 0.3024
rs6494221	0.97 (0.73-1.27) 0.8019	0.88 (0.53-1.45) 0.6085	0.77 (0.41-1.46) 0.4276	1.06 (0.8-1.39) 0.6872	1.05 (0.8-1.39) 0.7056	0.81 (0.61-1.08) 0.144	0.92 (0.68-1.24) 0.5823	0.84 (0.63-1.12) 0.2244
rs8043356	1.03 (0.73-1.45) 0.852	1.13 (0.6-2.12) 0.7043	1.25 (0.6-2.6) 0.5496	0.96 (0.68-1.35) 0.7994	1 (0.72-1.39) 0.9967	1.23 (0.86-1.74) 0.2532	0.88 (0.61-1.29) 0.5239	1.29 (0.91-1.84) 0.1515
rs12899193	1.02 (0.8-1.3) 0.866	0.87 (0.56-1.36) 0.5403	0.89 (0.51-1.53) 0.6609	1.01 (0.8-1.27) 0.9393	1 (1-1) 0.9992	0.98 (0.77-1.25) 0.856	0.94 (0.72-1.22) 0.6367	1 (1-1) 0.9984
rs12909890	1.06 (0.84-1.35) 0.6177	1.17 (0.74-1.83) 0.5002	1.31 (0.78-2.2) 0.314	1 (0.77-1.31) 0.9702	1.14 (0.89-1.44) 0.2966	0.89 (0.7-1.13) 0.3517	0.88 (0.68-1.14) 0.3479	0.9 (0.71-1.15) 0.4095
rs8024629	0.99 (0.74-1.32) 0.9524	0.8 (0.46-1.39) 0.4321	1 (0.33-3.01) 0.9986	1.03 (0.76-1.38) 0.8655	1.11 (0.84-1.48) 0.4586	0.84 (0.63-1.12) 0.2403	0.95 (0.7-1.28) 0.7176	0.83 (0.62-1.11) 0.2048
rs11635314	0.76 (0.55-1.05) 0.1005	1 (0.49-2.04) 0.989	0.94 (0.47-1.9) 0.8687	1.43 (1.01-2.04) **0.0461**	1.17 (0.84-1.65) 0.3551	0.95 (0.68-1.33) 0.7696	1.07 (0.74-1.55) 0.7294	0.98 (0.7-1.38) 0.9104
rs4775289	1.26 (1.01-1.58) **0.0428**	0.88 (0.58-1.33) 0.541	0.93 (0.58-1.5) 0.7809	0.98 (0.78-1.22) 0.829	1.04 (0.83-1.3) 0.7464	0.96 (0.77-1.2) 0.7283	0.94 (0.73-1.2) 0.5942	0.94 (0.75-1.18) 0.5906
rs17237367	0.97 (0.74-1.27) 0.8009	1 (0.66-1.53) 0.9889	1.12 (0.64-1.93) 0.693	1.01 (0.78-1.32) 0.9351	1.05 (0.81-1.37) 0.6855	0.89 (0.67-1.17) 0.3898	0.91 (0.68-1.22) 0.5388	0.89 (0.68-1.18) 0.4199
rs17191596	0.96 (0.68-1.36) 0.8262	0.98 (0.52-1.83) 0.9434	1.18 (0.56-2.47) 0.6661	0.87 (0.61-1.23) 0.4322	1.04 (0.74-1.46) 0.8306	0.97 (0.68-1.37) 0.8557	1.05 (0.73-1.51) 0.7751	0.96 (0.67-1.36) 0.8
rs4775292	1.23 (0.98-1.54) 0.0812	0.81 (0.55-1.2) 0.2881	0.71 (0.43-1.18) 0.1877	1 (0.79-1.25) 0.9753	0.99 (0.79-1.23) 0.8998	0.98 (0.78-1.23) 0.869	1 (0.77-1.29) 0.9771	0.97 (0.77-1.22) 0.7778
rs17204367	0.8 (0.64-1.01) 0.061	1.16 (0.77-1.74) 0.4834	1.26 (0.79-2.03) 0.3346	1.08 (0.86-1.35) 0.5263	1.05 (0.84-1.31) 0.665	0.91 (0.73-1.14) 0.4134	0.98 (0.76-1.25) 0.8451	0.93 (0.75-1.16) 0.5291
rs17204395	1.07 (0.81-1.41) 0.6432	1.28 (0.77-2.12) 0.3366	2.36 (1.17-4.74) **0.0159**	0.73 (0.55-0.99) **0.04**	0.96 (0.73-1.28) 0.7963	0.97 (0.72-1.29) 0.8165	1.03 (0.76-1.4) 0.839	0.96 (0.72-1.28) 0.7832
rs12437690	0.85 (0.68-1.06) 0.1406	1.07 (0.72-1.6) 0.7227	1.44 (0.89-2.33) 0.1332	1.05 (0.83-1.32) 0.6813	1.13 (0.9-1.42) 0.2835	0.96 (0.77-1.2) 0.7235	1.03 (0.81-1.31) 0.8349	0.98 (0.78-1.22) 0.8257
rs9302215	0.86 (0.68-1.08) 0.1917	1.13 (0.75-1.7) 0.5473	1.47 (0.89-2.41) 0.1327	1.06 (0.84-1.34) 0.6361	1.13 (0.9-1.42) 0.2949	0.93 (0.74-1.18) 0.5569	0.96 (0.75-1.24) 0.7671	0.95 (0.75-1.19) 0.6511
rs17204440	0.92 (0.74-1.14) 0.4501	1.11 (0.76-1.62) 0.5979	1.29 (0.81-2.06) 0.2778	1.03 (0.83-1.3) 0.7638	1.07 (0.86-1.33) 0.5656	0.98 (0.79-1.23) 0.8782	0.94 (0.74-1.2) 0.6235	0.99 (0.79-1.23) 0.9167
rs7164773	1.17 (0.94-1.46) 0.1523	0.89 (0.6-1.33) 0.5622	0.61 (0.38-1) **0.048**	0.94 (0.75-1.17) 0.5869	0.84 (0.67-1.06) 0.1407	1.09 (0.88-1.37) 0.4265	1.03 (0.8-1.31) 0.8251	1.05 (0.84-1.32) 0.638
rs10519067	1.14 (0.82-1.6) 0.439	0.99 (0.53-1.85) 0.9717	1.05 (0.54-2.03) 0.8944	0.99 (0.7-1.42) 0.9656	0.95 (0.67-1.34) 0.7543	1.04 (0.73-1.47) 0.8423	0.88 (0.6-1.3) 0.5214	1.01 (0.71-1.43) 0.9512
rs12438866	1.08 (0.87-1.36) 0.4787	1.23 (0.83-1.83) 0.3054	1.72 (1.03-2.87) **0.0372**	0.84 (0.66-1.06) 0.1398	1 (0.8-1.26) 0.9654	0.99 (0.79-1.25) 0.9479	0.98 (0.77-1.26) 0.8811	0.97 (0.77-1.22) 0.7942
rs17204454	1.16 (0.94-1.44) 0.1702	0.89 (0.61-1.3) 0.5546	0.56 (0.34-0.92) **0.0228**	1.03 (0.82-1.28) 0.812	0.95 (0.76-1.18) 0.6327	0.95 (0.77-1.19) 0.6796	0.96 (0.75-1.22) 0.7135	0.94 (0.75-1.17) 0.5671
rs922782	1.17 (0.94-1.45) 0.1719	0.92 (0.61-1.38) 0.6873	0.82 (0.51-1.33) 0.4214	0.81 (0.64-1.02) 0.0707	0.84 (0.67-1.05) 0.1281	1.07 (0.85-1.35) 0.5654	1.11 (0.87-1.41) 0.4036	1.03 (0.82-1.31) 0.7786
rs7173227	0.66 (0.48-0.91) **0.0115**	0.93 (0.53-1.64) 0.8113	1.27 (0.64-2.53) 0.4873	1.34 (0.95-1.88) 0.0955	1.3 (0.93-1.8) 0.1208	1.05 (0.76-1.46) 0.7465	1.12 (0.78-1.59) 0.5376	1.09 (0.78-1.51) 0.6158
rs2899662	1.39 (1.1-1.75) **0.0058**	0.92 (0.6-1.41) 0.7084	0.74 (0.45-1.22) 0.2399	1.22 (0.97-1.53) 0.0912	1.14 (0.9-1.43) 0.2762	0.81 (0.64-1.02) 0.0704	0.72 (0.55-0.93) **0.0135**	0.79 (0.62-0.99) **0.0446**
rs341459	0.93 (0.73-1.18) 0.5363	1.09 (0.71-1.68) 0.6874	1.15 (0.67-1.95) 0.6193	0.77 (0.61-0.98) **0.0373**	0.88 (0.7-1.12) 0.3181	1.08 (0.85-1.38) 0.5356	1.14 (0.89-1.46) 0.3054	1.07 (0.84-1.37) 0.5706
rs10162630	0.89 (0.71-1.11) 0.2903	1.21 (0.81-1.82) 0.3511	1.42 (0.88-2.29) 0.1509	0.7 (0.56-0.88) **0.0024**	0.77 (0.61-0.97) **0.0241**	1.18 (0.94-1.48) 0.1584	1.29 (1-1.66) **0.0486**	1.16 (0.93-1.46) 0.1911
rs12591848	0.51 (0.35-0.74) **4.60e-04**	0.64 (0.32-1.28) 0.2034	0.67 (0.29-1.52) 0.3366	1.69 (1.15-2.5) **0.0079**	1.38 (0.94-2.02) 0.0992	1.05 (0.72-1.54) 0.7979	1.18 (0.78-1.79) 0.4388	1.16 (0.8-1.68) 0.4425
rs7171681	1.39 (1.09-1.77) **0.0085**	1.01 (0.66-1.54) 0.9708	0.93 (0.57-1.51) 0.7577	1.09 (0.86-1.38) 0.4891	1.08 (0.85-1.38) 0.5213	0.86 (0.68-1.11) 0.245	0.77 (0.58-1.01) 0.0578	0.86 (0.67-1.1) 0.2219
rs7169281	0.79 (0.63-0.99) **0.0374**	0.71 (0.48-1.05) 0.0885	0.78 (0.49-1.24) 0.2896	0.97 (0.78-1.21) 0.7875	0.94 (0.76-1.17) 0.5815	1.08 (0.86-1.34) 0.5193	1.15 (0.9-1.46) 0.2569	1.05 (0.84-1.3) 0.6876
rs10152719	0.98 (0.73-1.31) 0.8812	1.51 (0.85-2.7) 0.1606	1 (0.54-1.83) 0.9912	0.84 (0.63-1.12) 0.2377	0.83 (0.62-1.12) 0.2239	1.18 (0.87-1.59) 0.2783	1.13 (0.8-1.58) 0.4899	1.19 (0.89-1.61) 0.2456
rs341382	1.29 (1-1.66) **0.0494**	0.94 (0.61-1.44) 0.767	0.91 (0.55-1.5) 0.7154	1.11 (0.87-1.43) 0.4023	1.07 (0.83-1.38) 0.5987	0.86 (0.66-1.11) 0.2427	0.8 (0.6-1.06) 0.1249	0.86 (0.66-1.11) 0.2536
rs341392	1.13 (0.86-1.48) 0.3737	1.63 (1-2.66) 0.0507	1.25 (0.75-2.08) 0.3962	0.94 (0.72-1.23) 0.669	1 (0.77-1.29) 0.9938	1.03 (0.78-1.35) 0.8544	0.96 (0.72-1.29) 0.8113	1.03 (0.78-1.35) 0.8551
rs6494229	1.29 (1.03-1.62) **0.0263**	1.25 (0.85-1.85) 0.2562	1.07 (0.68-1.68) 0.7799	1.01 (0.81-1.26) 0.951	1.01 (0.8-1.26) 0.9586	0.94 (0.76-1.18) 0.6083	0.83 (0.65-1.05) 0.12	0.95 (0.76-1.19) 0.6665
rs8042149	1.32 (1.05-1.67) **0.0194**	1.37 (0.92-2.05) 0.1214	1.33 (0.84-2.11) 0.2238	1.18 (0.94-1.47) 0.1623	1.27 (1.02-1.6) **0.0342**	0.83 (0.66-1.04) 0.1068	0.75 (0.59-0.96) **0.0226**	0.84 (0.67-1.05) 0.131
rs4775301	1.36 (1.08-1.71) **0.0097**	1.32 (0.89-1.97) 0.1651	1.19 (0.76-1.86) 0.454	1.14 (0.91-1.42) 0.2563	1.22 (0.98-1.53) 0.0751	0.8 (0.64-1.01) 0.0595	0.73 (0.57-0.93) **0.0116**	0.82 (0.65-1.03) 0.083
rs11071561	1.29 (1.02-1.64) **0.0337**	1.22 (0.82-1.81) 0.3352	1.27 (0.8-2) 0.3102	1.06 (0.84-1.33) 0.6184	1.12 (0.89-1.41) 0.3165	0.84 (0.66-1.05) 0.1304	0.77 (0.6-0.99) **0.041**	0.85 (0.67-1.07) 0.1618

	NPSR1							
RORA	rs740347	rs1419779	rs324981	rs325462	rs17789420	rs34705969	rs727162	rs6972158
rs17191582	1.14 (0.76-1.72) 0.5273	1.17 (0.84-1.63) 0.3445	1.14 (0.83-1.56) 0.4305	0.96 (0.69-1.32) 0.781	0.97 (0.59-1.6) 0.9057	1.97 (0.71-5.49) 0.195	1.26 (0.84-1.88) 0.2654	0.94 (0.68-1.29) 0.6955
rs6494221	1.07 (0.74-1.54) 0.712	1.21 (0.9-1.62) 0.209	1.23 (0.92-1.63) 0.1576	0.86 (0.65-1.14) 0.2978	1.03 (0.68-1.57) 0.8871	1.68 (0.65-4.32) 0.2857	1.16 (0.81-1.65) 0.4249	0.97 (0.73-1.3) 0.8415
rs8043356	0.91 (0.57-1.46) 0.6942	0.82 (0.57-1.18) 0.2861	0.85 (0.6-1.21) 0.3672	1.19 (0.84-1.68) 0.3296	0.97 (0.55-1.71) 0.9239	0.35 (0.12-1.05) 0.0601	0.81 (0.53-1.24) 0.3351	1.03 (0.73-1.46) 0.8644
rs12899193	1.04 (0.75-1.44) 0.8229	1.05 (0.81-1.36) 0.7022	1 (0.78-1.29) 0.9876	1.01 (0.79-1.31) 0.9078	0.98 (0.67-1.43) 0.8994	0.86 (0.38-1.93) 0.707	1.01 (0.75-1.36) 0.958	1.07 (0.83-1.38) 0.5975
rs12909890	0.93 (0.67-1.28) 0.6574	1.06 (0.82-1.36) 0.645	1.18 (0.93-1.49) 0.1678	0.91 (0.71-1.15) 0.4198	0.92 (0.62-1.35) 0.6647	1.7 (0.76-3.82) 0.1942	1.14 (0.84-1.55) 0.3973	0.94 (0.73-1.22) 0.6596
rs8024629	0.98 (0.68-1.42) 0.915	1.19 (0.88-1.59) 0.2541	1.21 (0.91-1.6) 0.2	0.88 (0.65-1.18) 0.3881	0.88 (0.56-1.4) 0.5985	1.65 (0.64-4.26) 0.2998	1.15 (0.79-1.68) 0.4628	0.9 (0.67-1.21) 0.4886
rs11635314	0.91 (0.57-1.44) 0.6802	0.76 (0.54-1.06) 0.1003	0.79 (0.57-1.1) 0.1606	1.1 (0.79-1.54) 0.5695	0.64 (0.37-1.11) 0.1153	4.04 (1.02-15.97) **0.0461**	0.91 (0.6-1.39) 0.6693	0.91 (0.65-1.28) 0.5992
rs4775289	1.22 (0.88-1.67) 0.2312	1.27 (1-1.61) **0.0462**	1.06 (0.85-1.32) 0.6241	1.02 (0.81-1.28) 0.8779	1.23 (0.84-1.8) 0.2836	1.18 (0.63-2.23) 0.6091	1.28 (0.97-1.68) 0.08	0.95 (0.75-1.21) 0.6638
rs17237367	1.03 (0.72-1.47) 0.8753	1.03 (0.77-1.37) 0.835	1.21 (0.92-1.59) 0.1651	0.84 (0.64-1.1) 0.2113	1.32 (0.86-2.02) 0.1987	0.7 (0.29-1.72) 0.4397	0.89 (0.64-1.24) 0.4898	1.15 (0.88-1.51) 0.308
rs17191596	1 (1-1) 0.9993	1.17 (0.83-1.65) 0.38	1.11 (0.79-1.56) 0.5413	1 (0.71-1.41) 0.9923	0.86 (0.5-1.5) 0.6021	1.87 (0.64-5.46) 0.2538	1.06 (0.7-1.62) 0.7687	0.84 (0.59-1.19) 0.3272
rs4775292	1.16 (0.84-1.6) 0.3814	1.19 (0.93-1.51) 0.1634	1.04 (0.83-1.29) 0.7485	1.03 (0.82-1.29) 0.8104	1.36 (0.94-1.98) 0.0993	1.01 (0.51-2.02) 0.9729	1.27 (0.96-1.69) 0.0942	1.13 (0.89-1.45) 0.323
rs17204367	0.89 (0.66-1.21) 0.4685	0.95 (0.75-1.2) 0.644	1.05 (0.85-1.31) 0.6496	0.91 (0.73-1.14) 0.4114	0.89 (0.62-1.28) 0.5284	1.19 (0.57-2.49) 0.6532	0.83 (0.63-1.1) 0.1953	0.94 (0.74-1.18) 0.5864
rs17204395	1.01 (0.69-1.49) 0.9598	1.27 (0.95-1.69) 0.1075	1.16 (0.88-1.54) 0.2897	0.97 (0.73-1.28) 0.8055	0.95 (0.62-1.46) 0.8247	1.31 (0.49-3.54) 0.5877	0.95 (0.66-1.36) 0.7671	0.91 (0.68-1.21) 0.5034
rs12437690	0.95 (0.7-1.29) 0.7476	0.94 (0.75-1.19) 0.607	1 (0.78-1.29) 0.9749	0.98 (0.79-1.22) 0.8507	0.92 (0.65-1.31) 0.6447	1.7 (0.81-3.56) 0.1614	0.86 (0.65-1.13) 0.2756	0.97 (0.77-1.22) 0.8074
rs9302215	1.05 (0.76-1.45) 0.7604	0.96 (0.76-1.22) 0.7245	1.01 (0.81-1.27) 0.904	0.99 (0.79-1.24) 0.9257	0.88 (0.61-1.26) 0.4759	1.86 (0.87-3.96) 0.1086	0.87 (0.65-1.16) 0.3428	0.9 (0.71-1.15) 0.4107
rs17204440	0.91 (0.67-1.24) 0.556	0.94 (0.74-1.19) 0.6016	1.01 (0.81-1.26) 0.9437	0.99 (0.79-1.24) 0.9297	0.85 (0.59-1.23) 0.3873	1.21 (0.61-2.41) 0.5833	0.87 (0.66-1.14) 0.3197	1.02 (0.81-1.3) 0.8575
rs7164773	1.07 (0.79-1.45) 0.6555	1.11 (0.88-1.4) 0.3709	0.96 (0.77-1.2) 0.739	1.01 (0.81-1.27) 0.91	1.24 (0.87-1.75) 0.2326	0.51 (0.24-1.08) 0.0792	0.95 (0.72-1.27) 0.7434	1.07 (0.84-1.35) 0.5866
rs10519067	0.9 (0.54-1.5) 0.6963	1 (0.7-1.42) 0.9915	1.09 (0.77-1.53) 0.6387	0.91 (0.64-1.3) 0.6078	1.01 (0.58-1.77) 0.961	0.53 (0.2-1.43) 0.211	1 (0.66-1.53) 0.9851	1.16 (0.82-1.65) 0.4073
rs12438866	0.91 (0.66-1.24) 0.5438	1.17 (0.92-1.49) 0.2118	1.12 (0.9-1.41) 0.3068	0.93 (0.74-1.17) 0.5294	0.96 (0.66-1.39) 0.8386	0.84 (0.4-1.78) 0.6558	0.93 (0.7-1.25) 0.6409	1.04 (0.82-1.32) 0.7442
rs17204454	1.02 (0.75-1.38) 0.9189	1.1 (0.87-1.39) 0.4216	1.04 (0.84-1.3) 0.7196	0.97 (0.78-1.21) 0.7917	1.11 (0.78-1.58) 0.5637	0.92 (0.46-1.82) 0.8056	1.17 (0.9-1.54) 0.2436	0.95 (0.75-1.19) 0.6445
rs922782	1.15 (0.84-1.58) 0.3772	1.28 (1.01-1.63) **0.0384**	0.97 (0.77-1.21) 0.7611	1.11 (0.89-1.4) 0.3521	1.08 (0.76-1.54) 0.6679	1.09 (0.57-2.11) 0.7931	0.93 (0.71-1.21) 0.582	0.99 (0.79-1.24) 0.9379
rs7173227	1.12 (0.69-1.8) 0.6571	0.73 (0.51-1.04) 0.0822	0.88 (0.63-1.22) 0.4457	1.01 (0.73-1.41) 0.9291	1.02 (0.6-1.74) 0.9452	1.07 (0.36-3.16) 0.904	0.81 (0.54-1.22) 0.3166	1.12 (0.8-1.56) 0.4992
rs2899662	1.45 (1.06-1.99) **0.0204**	1.35 (1.05-1.72) **0.0173**	1.05 (0.84-1.33) 0.6619	0.91 (0.72-1.15) 0.4354	1.29 (0.88-1.91) 0.1952	0.94 (0.48-1.88) 0.8705	1.09 (0.83-1.44) 0.5197	0.97 (0.76-1.24) 0.809
rs341459	0.88 (0.64-1.21) 0.4302	1.03 (0.8-1.32) 0.8301	1.05 (0.83-1.33) 0.6927	1.04 (0.82-1.32) 0.7718	0.9 (0.62-1.3) 0.5806	1.68 (0.77-3.67) 0.1945	1 (0.74-1.34) 0.9905	0.95 (0.75-1.2) 0.6582
rs10162630	0.78 (0.57-1.07) 0.1265	0.97 (0.77-1.23) 0.8208	1.03 (0.83-1.29) 0.765	1.01 (0.81-1.27) 0.8955	0.92 (0.64-1.32) 0.6511	0.94 (0.48-1.84) 0.8513	0.93 (0.71-1.22) 0.6145	1.06 (0.84-1.35) 0.6204
rs12591848	0.78 (0.45-1.35) 0.3722	0.45 (0.3-0.68) **1.51e-04**	0.84 (0.58-1.24) 0.385	1.1 (0.75-1.61) 0.6248	0.74 (0.4-1.38) 0.3401	1.81 (0.58-5.65) 0.3063	0.86 (0.55-1.36) 0.5273	0.87 (0.59-1.26) 0.4572
rs7171681	1.23 (0.88-1.73) 0.2307	1.25 (0.97-1.6) 0.0812	1.02 (0.8-1.3) 0.8711	0.95 (0.75-1.21) 0.6915	1.21 (0.81-1.81) 0.3442	1.04 (0.52-2.07) 0.9159	1.25 (0.93-1.68) 0.1352	1 (0.67-1.51) 0.9962
rs7169281	0.95 (0.71-1.28) 0.7439	0.92 (0.73-1.16) 0.4694	1.06 (0.85-1.33) 0.5778	0.98 (0.78-1.22) 0.8445	1.01 (0.71-1.44) 0.9512	1.24 (0.63-2.45) 0.5299	0.8 (0.61-1.05) 0.1081	0.93 (0.75-1.17) 0.553
rs10152719	0.66 (0.43-1.02) 0.0642	0.81 (0.59-1.11) 0.1944	0.85 (0.63-1.16) 0.3045	1.12 (0.83-1.52) 0.451	0.64 (0.38-1.08) 0.097	0.62 (0.24-1.61) 0.3281	1.02 (0.72-1.46) 0.8948	1.22 (0.9-1.65) 0.1962
rs341382	1.21 (0.86-1.7) 0.2664	1.2 (0.93-1.55) 0.1678	1.01 (0.8-1.29) 0.9222	0.97 (0.76-1.24) 0.8032	1.18 (0.78-1.77) 0.4372	1.1 (0.55-2.21) 0.7867	1.28 (0.95-1.73) 0.1007	1.06 (0.81-1.38) 0.6802
rs341392	0.9 (0.62-1.31) 0.5867	0.98 (0.74-1.3) 0.9067	0.98 (0.74-1.28) 0.8643	0.96 (0.73-1.25) 0.756	0.97 (0.62-1.51) 0.8789	0.46 (0.18-1.2) 0.1141	1 (0.75-1.35) 0.9789	1.07 (0.82-1.41) 0.6217
rs6494229	0.99 (0.73-1.34) 0.9533	1.08 (0.85-1.36) 0.5245	0.96 (0.77-1.2) 0.7167	0.99 (0.79-1.24) 0.9119	0.94 (0.65-1.36) 0.76	0.85 (0.42-1.72) 0.6583	1.31 (1-1.72) **0.049**	1.13 (0.9-1.42) 0.302
rs8042149	1.21 (0.89-1.64) 0.2259	1.2 (0.95-1.52) 0.1337	1.1 (0.88-1.38) 0.386	0.87 (0.69-1.08) 0.2125	1.2 (0.84-1.73) 0.3174	0.98 (0.47-2.06) 0.9636	1.19 (0.9-1.56) 0.2231	1.07 (0.85-1.35) 0.5654
rs4775301	1.22 (0.9-1.65) 0.1904	1.27 (1-1.61) **0.05**	1.15 (0.92-1.44) 0.2172	0.85 (0.68-1.06) 0.1502	1.24 (0.86-1.77) 0.2509	1.19 (0.57-2.48) 0.6398	1.29 (0.98-1.69) 0.0674	1.05 (0.83-1.33) 0.6654
rs11071561	0.99 (0.73-1.35) 0.953	1.17 (0.92-1.49) 0.2032	1.14 (0.91-1.42) 0.2709	0.86 (0.69-1.08) 0.2043	1.05 (0.72-1.52) 0.8147	1.32 (0.63-2.77) 0.464	1.33 (1-1.76) **0.0471**	1.01 (0.8-1.28) 0.9471

Supplementary Table S3. Complete replication results of RORA*NPSR1 interactions on asthma in BAMSE and MAAS.

effect direction different to MAGICS/ISAAC
effect direction the same as in MAGICS/ISAAC
borderline significant replication
significant replication of interaction on asthma

RORA	***NPSR1***	**Asthma** (MAGICS/ISAAC)	**Asthma** (BAMSE)	**Asthma** (MAAS)
rs7173227	rs2530547	0.7 (0.5-0.99) **0.0446**	0.75 (0.54-1.05) 0.0934	1.07 (0.62-1.84) 0.8036
	rs887020	0.71 (0.51-0.98) **0.0397**	0.9 (0.64-1.27) 0.5487	0.83 (0.5-1.37) 0.4622
	rs963218	0.66 (0.48-0.91) **0.0115**	0.74 (0.53-1.04) 0.0814	1.05 (0.66-1.66) 0.8478
rs2899662	rs887020	1.34 (1.06-1.7) **0.0149**	**1.41 (1.06-1.87) 0.0182**	**1.46 (1.02-2.09) 0.0407**
	rs963218	1.39 (1.1-1.75) **0.0058**	**1.33 (1.01-1.75) 0.0448**	1.29 (0.9-1.83) 0.162
	rs324396	0.72 (0.55-0.93) **0.0135**	0.82 (0.61-1.1) 0.1836	**0.61 (0.41-0.92) 0.0166**
	rs324957	0.79 (0.62-0.99) **0.0446**	na	0.9 (0.63-1.28) 0.5538
	rs740347	1.45 (1.06-1.99) **0.0204**	1.23 (0.84-1.81) 0.2787	0.97 (0.59-1.6) 0.9012
	rs1419779	1.35 (1.05-1.72) **0.0173**	na	1.08 (0.75-1.56) 0.6741
rs10162630	rs1345267	0.7 (0.56-0.88) **0.0024**	na	0.85 (0.6-1.21) 0.3677
	rs323922	0.77 (0.61-0.97) **0.0241**	0.88 (0.68-1.15) 0.3564	0.8 (0.57-1.12) 0.1864
	rs324396	1.29 (1-1.66) **0.0486**	1.16 (0.88-1.55) 0.2963	1.35 (0.93-1.97) 0.1131
rs12591848	rs2609234	0.58 (0.34-0.99) **0.0458**	na	1.87 (0.9-3.87) 0.0922
	rs714588	0.63 (0.43-0.92) **0.0178**	**0.65 (0.43-0.98) 0.0412**	1.26 (0.69-2.32) 0.4492
	rs2530547	0.54 (0.36-0.8) **0.0025**	0.71 (0.48-1.06) 0.0915	0.81 (0.42-1.55) 0.5228
	rs887020	0.54 (0.36-0.8) **0.0019**	0.82 (0.55-1.23) 0.3374	0.75 (0.4-1.43) 0.3883
	rs1379928	0.64 (0.41-0.99) **0.0442**	0.87 (0.52-1.45) 0.5946	1.29 (0.64-2.58) 0.4725
	rs963218	0.51 (0.35-0.74) **4.60e-04**	0.71 (0.47-1.06) 0.0897	0.65 (0.36-1.18) 0.1603
	rs1345267	1.69 (1.15-2.5) **0.0079**	na	1.08 (0.64-1.83) 0.7668
	rs1419779	0.45 (0.3-0.68) **1.51e-04**	na	0.77 (0.43-1.36) 0.3633
rs8042149	rs714588	1.27 (1.01-1.59) **0.0407**	**1.58 (1.2-2.09) 0.0012**	1.02 (0.72-1.45) 0.9143
	rs1379928	1.38 (1.07-1.8) **0.0143**	1.15 (0.82-1.61) 0.4214	0.85 (0.58-1.25) 0.4141
	rs963218	1.32 (1.05-1.67) **0.0194**	1 (0.77-1.3) 0.9809	1.05 (0.75-1.47) 0.7783
	rs323922	1.27 (1.02-1.6) **0.0342**	0.97 (0.75-1.27) 0.8368	0.99 (0.71-1.39) 0.9738
	rs324396	0.75 (0.59-0.96) **0.0226**	0.9 (0.68-1.2) 0.4705	0.8 (0.55-1.15) 0.2267
rs4775301	rs714588	1.29 (1.03-1.61) **0.0248**	**1.39 (1.05-1.84) 0.0202**	1.14 (0.8-1.63) 0.4583
	rs1379928	1.34 (1.03-1.74) **0.0276**	1.02 (0.73-1.44) 0.9001	0.84 (0.56-1.25) 0.3898
	rs963218	1.36 (1.08-1.71) **0.0097**	1.01 (0.77-1.33) 0.9379	1.05 (0.74-1.49) 0.7731
	rs324396	0.73 (0.57-0.93) **0.0116**	0.9 (0.67-1.2) 0.4701	0.7 (0.48-1.02) 0.0605
	rs1419779	1.27 (1-1.61) **0.05**	na	1.01 (0.71-1.45) 0.9444
rs11071561	rs963218	1.29 (1.02-1.64) **0.0337**	1.13 (0.87-1.47) 0.3656	1.32 (0.91-1.9) 0.1392
	rs324396	0.77 (0.6-0.99) **0.041**	1.07 (0.8-1.43) 0.6608	**0.62 (0.42-0.93) 0.0191**

	rs727162	1.33 (1-1.76) **0.0471**	1.02 (0.73-1.43) 0.8856	1.52 (0.99-2.33) 0.0557
rs8043356	rs1379928	0.67 (0.45-1) **0.0484**	1.01 (0.64-1.6) 0.9664	0.92 (0.53-1.59) 0.7578
rs4775289	rs963218	1.26 (1.01-1.58) **0.0428**	1.3 (0.99-1.71) 0.058	1.09 (0.78-1.52) 0.6272
rs7171681		1.39 (1.09-1.77) **0.0085**	1.28 (0.98-1.69) 0.0752	1.01 (0.69-1.47) 0.9544
rs7169281		0.79 (0.63-0.99) **0.0374**	0.91 (0.7-1.17) 0.461	1.3 (0.91-1.85) 0.156
rs341382		1.29 (1-1.66) **0.0494**	1.26 (0.95-1.67) 0.1072	1.19 (0.81-1.76) 0.373
rs6494229		1.29 (1.03-1.62) **0.0263**	1.12 (0.87-1.46) 0.3811	1.32 (0.91-1.92) 0.1373
rs17204395	rs323917	2.36 (1.17-4.74) **0.0159**		0.99 (0.4-2.46) 0.9761
rs7164773		0.61 (0.38-1) **0.048**	0.72 (0.4-1.31) 0.2786	0.87 (0.39-1.91) 0.7251
rs12438866		1.72 (1.03-2.87) **0.0372**	1.02 (0.57-1.8) 0.9512	1.35 (0.65-2.82) 0.4265
rs17204454		0.56 (0.34-0.92) **0.0228**	1.43 (0.81-2.53) 0.223	1.02 (0.48-2.18) 0.9512
rs11635314	rs1345267	1.43 (1.01-2.04) **0.0461**	na	1.3 (0.83-2.04) 0.2486
rs17204395		0.73 (0.55-0.99) **0.04**	na	0.73 (0.46-1.17) 0.1905
rs341459		0.77 (0.61-0.98) **0.0373**	na	0.72 (0.48-1.07) 0.1007
rs4775289	rs1419779	1.27 (1-1.61) **0.0462**	na	1.05 (0.74-1.49) 0.7823
rs922782		1.28 (1.01-1.63) **0.0384**	na	0.87 (0.61-1.24) 0.436

Supplementary Table S4. Direct association of SNPs in *RORA* and *NPSR1* with nocturnal asthma symptoms in MAGICS/ISAAC

Chr	SNP	Position	Dataset	Gene	Minor allele	MAF	N	Nocturnal asthma	
								OR (95% CI)	p-value
7	rs2609234	34648813	MALDI	*NPSR1*	T	0,16	727	0.68 (0.47 – 1.00)	0,05
7	rs1006392	34651330	MALDI	*NPSR1*	C	0,43	733	1.04 (0.80 – 1.34)	0,76
7	rs714588	34653614	MALDI	*NPSR1*	G	0,44	734	0.79 (0.61 – 1.03)	0,076
7	rs1963499	34657848	Imputed	*NPSR1*	A	0,1	794	0.97 (0.64 – 1.46)	0,88
7	rs2168890	34657860	Imputed	*NPSR1*	T	0,13	794	0.88 (0.60 – 1.30)	0,51
7	rs2530547	34658310	MALDI	*NPSR1*	T	0,36	792	0.98 (0.76 – 1.26)	0,85
7	rs887020	34658370	MALDI	*NPSR1*	A	0,44	836	0.96 (0.75 – 1.22)	0,56
7	rs1379928	34661677	Chip	*NPSR1*	G	0,22	789	0.77 (0.56 – 1.05)	0,096
7	rs963218	34672157	Imputed	*NPSR1*	A	0,45	794	0.87 (0.67 – 1.12)	0,27
7	rs2609215	34676155	Chip	*NPSR1*	C	0,08	794	0.73 (0.45 – 1.19)	0,21
7	rs323917	34702031	MALDI	*NPSR1*	G	0,07	735	0.82 (0.48 – 1.41)	0,48
7	rs1345267	34708447	Chip	*NPSR1*	G	0,39	794	1.21 (0.94 – 1.57)	0,14
7	rs323922	34709170	Imputed	*NPSR1*	C	0,42	794	1.18 (0.91 – 1.52)	0,21
7	rs324384	34742415	Imputed	*NPSR1*	C	0,43	794	0.88 (0.68 – 1.14)	0,34
7	rs324396	34750511	Chip	*NPSR1*	T	0,3	759	0.89 (0.68 – 1.18)	0,44
7	rs324957	34761760	Chip	*NPSR1*	A	0,43	793	0.91 (0.70 – 1.18)	0,47
7	rs740347	34772690	MALDI	*NPSR1*	C	0,14	736	1.08 (0.75 – 1.55)	0,69
7	rs1419779	34773696	Chip	*NPSR1*	G	0,34	794	0.97 (0.75 – 1.27)	0,85
7	rs324981	34778501	Imputed	*NPSR1*	T	0,49	794	1.13 (0.88 – 1.44)	0,34
7	rs325462	34810234	Imputed	*NPSR1*	A	0,47	794	0.87 (0.68 – 1.12)	0,28
7	rs17789420	34813053	Imputed	*NPSR1*	A	0,1	794	1.03 (0.68 – 1.55)	0,91
7	rs34705969	34827512	Imputed	*NPSR1*	T	0,03	794	1.85 (0.90 – 3.81)	0,092
7	rs727162	34834426	Imputed	*NPSR1*	G	0,21	794	1.13 (0.83 – 1.55)	0,44
7	rs6972158	34849570	MALDI	*NPSR1*	G	0,33	834	0.77 (0.59 – 0.99)	**0,048**
15	rs17191582	60722975	Imputed	*RORA*	G	0,16	794	1.23 (0.88 – 1.71)	0,23
15	rs6494221	60723908	Chip	*RORA*	C	0,2	793	1.17 (0.87 – 1.57)	0,31
15	rs8043356	60723970	Imputed	*RORA*	T	0,14	794	1.10 (0.76 – 1.59)	0,63
15	rs12899193	60724097	Imputed	*RORA*	C	0,32	794	1.14 (0.87 – 1.48)	0,33
15	rs12909890	60725778	Imputed	*RORA*	G	0,37	794	1.34 (1.03 – 1.74)	**0,0321**
15	rs8024629	60728055	Imputed	*RORA*	A	0,17	794	1.12 (0.82 – 1.54)	0,46
15	rs11635314	60736287	Imputed	*RORA*	T	0,13	794	1.06 (0.72 – 1.57)	0,76
15	rs4775289	60736677	Chip	*RORA*	A	0,43	794	0.94 (0.73 – 1.22)	0,64
15	rs17237367	60739770	Imputed	*RORA*	A	0,23	794	0.90 (0.66 – 1.23)	0,52
15	rs17191596	60743552	Imputed	*RORA*	C	0,12	794	1.40 (0.99 – 1.98)	0,059
15	rs4775292	60746874	Chip	*RORA*	T	0,39	794	0.80 (0.61 – 1.04)	0,094
15	rs17204367	60748287	Imputed	*RORA*	G	0,41	794	1.11 (0.86 – 1.43)	0,42

15	rs17204395	60757882	Chip	*RORA*	T	0,18	794	1.14 (0.83 – 1.56)	0,4
15	rs12437690	60763233	Imputed	*RORA*	A	0,4	794	1.20 (0.93 – 1.53)	0,16
15	rs9302215	60768168	Chip	*RORA*	T	0,36	785	1.12 (0.86 – 1.45)	0,39
15	rs17204440	60773888	Imputed	*RORA*	A	0,49	794	1.11 (0.86 – 1.43)	0,44
15	rs7164773	60775749	Chip	*RORA*	T	0,5	794	0.86 (0.67 – 1.10)	0,24
15	rs10519067	60776148	Chip	*RORA*	A	0,13	793	0.98 (0.67 – 1.44)	0,92
15	rs12438866	60776321	Imputed	*RORA*	C	0,38	794	1.23 (0.94 – 1.60)	0,13
15	rs17204454	60776612	Chip	*RORA*	C	0,48	794	0.81 (0.63 – 1.04)	0,095
15	rs922782	60777984	Imputed	*RORA*	G	0,49	794	0.88 (0.68 – 1.13)	0,32
15	rs7173227	60779075	Chip	*RORA*	T	0,14	789	1.15 (0.80 – 1.64)	0,45
15	rs2899662	60784020	Imputed	*RORA*	T	0,37	794	0.86 (0.66 – 1.13)	0,28
15	rs341459	60788136	Imputed	*RORA*	C	0,3	794	1.01 (0.77 – 1.33)	0,92
15	rs10162630	60792529	Chip	*RORA*	T	0,49	794	1.06 (0.82 – 1.36)	0,68
15	rs12591848	60793494	Chip	*RORA*	A	0,1	794	1.08 (0.72 – 1.62)	0,72
15	rs7171681	60819129	Chip	*RORA*	C	0,31	794	0.81 (0.61 – 1.08)	0,15
15	rs7169281	60821905	Imputed	*RORA*	C	0,49	794	1.07 (0.84 – 1.36)	0,59
15	rs10152719	60822458	Imputed	*RORA*	T	0,17	794	0.97 (0.69 – 1.36)	0,85
15	rs341382	60825632	Imputed	*RORA*	C	0,28	794	0.82 (0.61 – 1.10)	0,18
15	rs341392	60832036	Imputed	*RORA*	C	0,22	794	0.96 (0.71 – 1.29)	0,79
15	rs6494229	60832180	Imputed	*RORA*	A	0,47	794	0.93 (0.73 – 1.20)	0,59
15	rs8042149	60832754	Imputed	*RORA*	T	0,45	794	0.96 (0.75 – 1.23)	0,74
15	rs4775301	60834660	Imputed	*RORA*	T	0,46	794	0.85 (0.66 – 1.09)	0,21
15	rs11071561	60839484	Imputed	*RORA*	T	0,41	794	0.93 (0.72 – 1.21)	0,6

Supplementary Table S5. Interaction results of *RORA* * *NPSR1*-SNPs on asthma with nocturnal symptoms in MAGICS/ISAAC.

RORA	*NPSR1* rs2609234	rs1006392	rs714588	rs1963499	rs2168890	rs2530547	rs887020	rs1379928	rs963218	rs2609215	rs323917	rs1345267
rs17191582	0.87 (0.44-1.75) 0.7025	1.14 (0.7-1.85) 0.6101	0.89 (0.54-1.46) 0.6404	1.25 (0.57-2.7) 0.5797	1 (0.49-2.02) 0.9989	0.9 (0.54-1.5) 0.6741	1.11 (0.69-1.78) 0.6639	0.89 (0.5-1.59) 0.7026	1.25 (0.77-2.01) 0.3682	0.72 (0.28-1.85) 0.5002	0.6 (0.21-1.73) 0.3463	0.87 (0.54-1.4) 0.5618
rs6494221	0.97 (0.51-1.85) 0.931	1.02 (0.66-1.57) 0.9356	0.91 (0.59-1.39) 0.6482	1.19 (0.58-2.42) 0.6407	0.93 (0.48-1.82) 0.843	0.92 (0.59-1.45) 0.7265	0.99 (0.64-1.53) 0.9594	0.83 (0.5-1.4) 0.4936	1.24 (0.82-1.87) 0.316	0.87 (0.36-2.1) 0.7555	0.67 (0.25-1.85) 0.4421	0.81 (0.53-1.24) 0.3334
rs8043356	0.47 (0.2-1.12) 0.0881	0.87 (0.51-1.49) 0.6176	1.09 (0.64-1.85) 0.7497	0.94 (0.39-2.28) 0.898	0.85 (0.37-1.95) 0.7	1.38 (0.78-2.43) 0.2635	0.87 (0.5-1.5) 0.6134	0.41 (0.2-0.87) **0.0201**	0.96 (0.57-1.62) 0.8715	0.88 (0.28-2.69) 0.8157	1.41 (0.48-4.17) 0.5334	0.85 (0.49-1.48) 0.5712
rs12899193	0.73 (0.42-1.26) 0.2538	0.99 (0.68-1.44) 0.9485	1.03 (0.7-1.5) 0.891	1.14 (0.61-2.15) 0.6808	0.94 (0.53-1.68) 0.8321	1.09 (0.73-1.64) 0.6674	0.98 (0.68-1.43) 0.9294	0.72 (0.46-1.13) 0.1515	1.22 (0.84-1.76) 0.302	0.76 (0.35-1.64) 0.4839	0.88 (0.38-2.03) 0.7601	0.83 (0.57-1.2) 0.3143
rs12909890	0.86 (0.5-1.48) 0.5938	1.37 (0.94-2) 0.1027	0.78 (0.54-1.13) 0.189	1.46 (0.77-2.76) 0.2463	1.14 (0.63-2.09) 0.6607	1.02 (0.69-1.53) 0.9115	0.97 (0.67-1.39) 0.8581	0.83 (0.52-1.3) 0.4105	1.02 (0.71-1.48) 0.8961	1.29 (0.61-2.75) 0.5052	1.15 (0.52-2.5) 0.7341	0.85 (0.58-1.24) 0.3992
rs8024629	1.08 (0.56-2.1) 0.8141	1.1 (0.7-1.72) 0.681	1.07 (0.69-1.67) 0.7574	1.7 (0.81-3.58) 0.1625	1.29 (0.64-2.6) 0.4773	1.24 (0.78-1.97) 0.3657	1.25 (0.8-1.96) 0.3311	1.07 (0.63-1.82) 0.8055	1.5 (0.97-2.34) 0.0702	1.15 (0.49-2.68) 0.7531	1.06 (0.43-2.62) 0.891	0.73 (0.46-1.17) 0.1927
rs11635314	0.5 (0.22-1.17) 0.1109	1.66 (0.96-2.88) 0.0679	0.63 (0.37-1.09) 0.0987	0.89 (0.36-2.17) 0.7943	0.8 (0.34-1.87) 0.6047	0.74 (0.42-1.3) 0.2927	0.64 (0.37-1.09) 0.1017	0.62 (0.3-1.26) 0.1882	0.57 (0.33-0.98) **0.0434**	0.91 (0.28-2.9) 0.8667	0.32 (0.07-1.5) 0.1466	1.04 (0.59-1.85) 0.8824
rs4775289	1.92 (1.11-3.32) **0.0193**	0.95 (0.66-1.38) 0.7911	1.61 (1.13-2.29) **0.008**	1.72 (0.94-3.15) 0.0772	1.53 (0.87-2.68) 0.1391	1.51 (1.03-2.2) **0.0332**	1.53 (1.06-2.23) **0.0249**	1.42 (0.91-2.21) 0.1221	1.66 (1.15-2.39) **0.0063**	1.49 (0.74-2.99) 0.2686	1.42 (0.65-3.07) 0.3764	0.95 (0.66-1.36) 0.7672
rs17237367	0.62 (0.32-1.22) 0.1663	0.81 (0.53-1.24) 0.3294	0.65 (0.42-1.01) 0.0577	0.54 (0.25-1.16) 0.115	0.66 (0.33-1.34) 0.2482	0.85 (0.54-1.34) 0.4855	0.84 (0.54-1.31) 0.4398	0.79 (0.45-1.37) 0.3923	0.78 (0.5-1.21) 0.2633	0.6 (0.24-1.5) 0.2763	0.79 (0.3-2.03) 0.6205	1.05 (0.69-1.6) 0.8203
rs17191596	0.81 (0.37-1.76) 0.5977	1.02 (0.6-1.75) 0.9277	0.99 (0.59-1.65) 0.9691	1.6 (0.7-3.65) 0.2667	1.44 (0.66-3.14) 0.3613	1.42 (0.82-2.47) 0.207	1.14 (0.7-1.85) 0.6091	1.03 (0.57-1.86) 0.9275	1.52 (0.91-2.56) 0.1117	1.51 (0.61-3.73) 0.3757	1.36 (0.5-3.7) 0.5488	0.75 (0.44-1.28) 0.2864
rs4775292	1.78 (1.05-3.01) **0.0326**	0.84 (0.57-1.24) 0.38	1.32 (0.92-1.89) 0.1378	1.07 (0.6-1.9) 0.8222	1.06 (0.63-1.8) 0.8176	1.03 (0.69-1.54) 0.8855	1.35 (0.91-2) 0.136	1.68 (1.08-2.6) **0.02**	1.29 (0.89-1.88) 0.1822	1.12 (0.59-2.14) 0.7246	1.06 (0.48-2.36) 0.8768	1.17 (0.81-1.69) 0.4148
rs17204367	0.87 (0.52-1.44) 0.5821	0.88 (0.6-1.28) 0.5019	0.91 (0.64-1.3) 0.6094	1.24 (0.68-2.26) 0.476	1.23 (0.7-2.16) 0.4673	1.12 (0.76-1.65) 0.5529	0.97 (0.67-1.39) 0.8642	0.84 (0.54-1.3) 0.4297	0.93 (0.64-1.34) 0.6991	0.97 (0.49-1.94) 0.9393	1.31 (0.62-2.77) 0.4819	0.94 (0.65-1.35) 0.724
rs17204395	0.96 (0.48-1.96) 0.9191	0.9 (0.56-1.45) 0.6703	1.06 (0.68-1.66) 0.7844	1.6 (0.77-3.3) 0.2081	1.66 (0.83-3.33) 0.1504	1.46 (0.92-2.3) 0.1057	1.53 (0.98-2.38) 0.0616	0.92 (0.53-1.59) 0.7738	1.48 (0.96-2.29) 0.0768	1.11 (0.5-2.47) 0.7939	1.91 (0.7-5.21) 0.2072	0.67 (0.42-1.05) 0.0821
rs12437690	0.56 (0.34-0.95) **0.031**	1.2 (0.85-1.71) 0.2989	0.73 (0.52-1.03) 0.0754	1.03 (0.57-1.85) 0.9238	1.06 (0.61-1.83) 0.8369	1.08 (0.75-1.55) 0.6922	0.92 (0.65-1.3) 0.617	0.62 (0.39-0.97) **0.036**	0.91 (0.64-1.29) 0.5972	0.84 (0.42-1.69) 0.6233	0.86 (0.4-1.86) 0.7003	0.86 (0.6-1.24) 0.4237
rs9302215	0.86 (0.48-1.54) 0.6162	1.22 (0.83-1.8) 0.3061	0.83 (0.57-1.19) 0.3112	1.22 (0.65-2.32) 0.5366	1.26 (0.7-2.26) 0.4405	0.84 (0.57-1.24) 0.3711	0.87 (0.59-1.27) 0.4597	0.78 (0.49-1.24) 0.2968	0.97 (0.67-1.39) 0.8518	1.05 (0.52-2.13) 0.8899	1.15 (0.51-2.61) 0.7369	0.88 (0.61-1.28) 0.5033
rs17204440	0.78 (0.48-1.28) 0.3281	1.15 (0.79-1.66) 0.4733	0.83 (0.58-1.18) 0.2995	1.14 (0.63-2.05) 0.6699	1.11 (0.65-1.9) 0.7122	0.99 (0.68-1.44) 0.9726	0.93 (0.65-1.34) 0.703	0.71 (0.46-1.1) 0.122	0.9 (0.64-1.28) 0.5715	0.83 (0.42-1.63) 0.5896	0.67 (0.31-1.46) 0.3128	0.9 (0.63-1.3) 0.5886
rs7164773	1.07 (0.62-1.83) 0.8175	0.78 (0.55-1.12) 0.1829	1.4 (0.99-1.98) 0.0564	0.69 (0.37-1.26) 0.2258	0.73 (0.42-1.29) 0.281	1.14 (0.78-1.66) 0.4894	1.14 (0.8-1.63) 0.4669	1.18 (0.77-1.82) 0.4545	1.02 (0.73-1.44) 0.8878	0.75 (0.38-1.49) 0.4079	0.66 (0.3-1.44) 0.298	1.07 (0.75-1.52) 0.7239
rs10519067	1 (0.4-2.54) 0.995	0.98 (0.53-1.79) 0.9463	1.16 (0.67-2) 0.6054	0.98 (0.4-2.37) 0.9582	0.84 (0.35-2) 0.687	1.04 (0.58-1.88) 0.8835	1.1 (0.64-1.91) 0.7237	0.72 (0.35-1.5) 0.3857	0.83 (0.48-1.45) 0.5212	0.54 (0.15-1.98) 0.352	0.44 (0.1-1.94) 0.2764	1.01 (0.56-1.83) 0.9686
rs12438866	0.66 (0.38-1.13) 0.1278	1.13 (0.78-1.63) 0.5198	0.92 (0.64-1.32) 0.6472	1.03 (0.57-1.85) 0.9267	1.02 (0.6-1.74) 0.9449	1.28 (0.87-1.88) 0.209	1.07 (0.74-1.55) 0.7315	0.65 (0.41-1.02) 0.0619	1.06 (0.74-1.53) 0.7427	0.76 (0.38-1.51) 0.4304	0.71 (0.3-1.67) 0.4299	0.79 (0.54-1.15) 0.2195
rs17204454	1.51 (0.91-2.53) 0.1132	0.71 (0.49-1.03) 0.0716	1.28 (0.91-1.82) 0.161	0.99 (0.56-1.75) 0.9683	1.03 (0.61-1.75) 0.9101	1.12 (0.77-1.63) 0.567	1.11 (0.77-1.6) 0.5652	1.59 (1.04-2.43) **0.0318**	1.2 (0.85-1.7) 0.3059	1.25 (0.66-2.37) 0.5033	1.12 (0.5-2.5) 0.7765	1.14 (0.8-1.62) 0.4668
rs922782	0.77 (0.46-1.31) 0.3363	1 (0.7-1.44) 0.9974	1.05 (0.74-1.51) 0.7728	0.81 (0.44-1.49) 0.4942	0.98 (0.56-1.71) 0.9526	1.26 (0.87-1.83) 0.2223	1.26 (0.89-1.78) 0.1946	1.07 (0.69-1.66) 0.776	1.33 (0.93-1.89) 0.1173	0.86 (0.44-1.68) 0.6563	0.94 (0.44-1.98) 0.8636	0.79 (0.54-1.16) 0.2234
rs7173227	0.59 (0.27-1.31) 0.1968	1.32 (0.81-2.15) 0.2635	0.73 (0.44-1.2) 0.2185	0.94 (0.45-1.97) 0.8656	0.86 (0.41-1.81) 0.691	0.72 (0.43-1.21) 0.213	0.65 (0.39-1.08) 0.0944	0.72 (0.38-1.38) 0.3257	0.66 (0.4-1.09) 0.1027	0.75 (0.28-2.04) 0.5761	0.89 (0.28-2.83) 0.8382	1.31 (0.76-2.27) 0.3339
rs2899662	1.42 (0.86-2.36) 0.1732	0.77 (0.52-1.14) 0.186	1.1 (0.76-1.6) 0.5992	1.11 (0.59-2.1) 0.7391	1.11 (0.62-2) 0.7177	1.18 (0.8-1.76) 0.4049	1.25 (0.85-1.86) 0.2593	1.45 (0.92-2.27) 0.1095	1.38 (0.94-2.03) 0.1014	1.37 (0.66-2.84) 0.391	1.37 (0.61-3.08) 0.4438	1.31 (0.9-1.91) 0.1517
rs341459	0.98 (0.55-1.73) 0.9401	1.06 (0.72-1.56) 0.7803	0.99 (0.67-1.45) 0.9452	0.82 (0.41-1.63) 0.5698	1.01 (0.53-1.94) 0.9666	1.12 (0.75-1.66) 0.5939	1.18 (0.81-1.71) 0.3907	1.09 (0.68-1.75) 0.713	1.14 (0.78-1.68) 0.4894	0.95 (0.44-2.06) 0.8971	1.37 (0.59-3.2) 0.4624	0.74 (0.5-1.11) 0.1472
rs10162630	0.96 (0.56-1.64) 0.8799	1.1 (0.75-1.62) 0.6194	1.15 (0.8-1.67) 0.4463	0.79 (0.42-1.47) 0.4542	0.89 (0.5-1.57) 0.6835	0.98 (0.67-1.42) 0.8964	1.11 (0.76-1.61) 0.5921	0.91 (0.59-1.41) 0.6815	0.95 (0.67-1.36) 0.7936	0.95 (0.48-1.89) 0.8819	1 (0.45-2.19) 0.9909	0.63 (0.44-0.91) **0.0145**
rs12591848	0.86 (0.37-2.03) 0.7303	1.44 (0.81-2.58) 0.2161	0.53 (0.29-0.98) **0.0415**	1.18 (0.48-2.91) 0.7131	0.98 (0.41-2.34) 0.9666	0.49 (0.27-0.9) **0.0216**	0.44 (0.24-0.81) **0.0089**	0.74 (0.36-1.54) 0.4264	0.46 (0.25-0.84) **0.0108**	0.68 (0.21-2.22) 0.5192	0.59 (0.15-2.3) 0.4429	1.86 (1-3.47) 0.0515
rs7171681	1.99 (1.17-3.39) **0.0117**	0.68 (0.44-1.04) 0.0721	1.43 (0.97-2.11) 0.0737	1.28 (0.68-2.38) 0.4425	1.3 (0.73-2.33) 0.3763	1.54 (1.01-2.36) **0.0446**	1.43 (0.94-2.18) 0.094	1.69 (1.06-2.68) **0.0262**	1.85 (1.24-2.77) **0.0028**	1.51 (0.74-3.06) 0.2539	1.36 (0.65-2.86) 0.4171	1.28 (0.86-1.91) 0.2297
rs7169281	0.72 (0.44-1.17) 0.1797	0.95 (0.67-1.36) 0.7914	0.77 (0.55-1.09) 0.1413	1.1 (0.65-1.87) 0.7269	1.08 (0.65-1.78) 0.7726	0.98 (0.68-1.4) 0.8903	0.92 (0.66-1.3) 0.647	0.72 (0.47-1.11) 0.1417	0.74 (0.52-1.05) 0.0967	0.5 (0.25-1) **0.0493**	0.62 (0.29-1.32) 0.2171	1.11 (0.79-1.56) 0.5582
rs10152719	0.65 (0.3-1.38) 0.2595	1.31 (0.79-2.18) 0.3	1.05 (0.67-1.66) 0.8165	0.58 (0.23-1.47) 0.2507	0.76 (0.34-1.71) 0.5123	0.82 (0.5-1.35) 0.4454	0.8 (0.5-1.28) 0.3566	0.68 (0.36-1.29) 0.2353	0.79 (0.49-1.27) 0.3342	1.2 (0.41-3.54) 0.736	0.69 (0.23-2.05) 0.5012	0.66 (0.41-1.05) 0.082
rs341382	1.74 (1.03-2.93) **0.0376**	0.79 (0.52-1.2) 0.2665	1.35 (0.9-2.03) 0.1481	1.38 (0.74-2.57) 0.3138	1.33 (0.73-2.41) 0.3479	1.27 (0.83-1.95) 0.2722	1.44 (0.95-2.2) 0.0884	1.73 (1.07-2.77) **0.0243**	1.8 (1.18-2.75) **0.0063**	1.56 (0.76-3.2) 0.2301	1.52 (0.7-3.33) 0.2916	1.12 (0.74-1.69) 0.5986
rs341392	1.13 (0.64-1.98) 0.6764	1.06 (0.69-1.65) 0.7848	1.36 (0.91-2.04) 0.1356	0.54 (0.24-1.24) 0.1445	0.72 (0.36-1.46) 0.3649	0.9 (0.58-1.39) 0.6281	0.95 (0.63-1.42) 0.7874	0.84 (0.5-1.43) 0.5293	0.86 (0.56-1.33) 0.505	1.12 (0.48-2.61) 0.7912	0.65 (0.26-1.63) 0.3567	0.99 (0.65-1.52) 0.9769
rs6494229	1.23 (0.74-2.06) 0.4225	0.93 (0.65-1.34) 0.6947	1.36 (0.96-1.94) 0.0864	1 (0.56-1.79) 0.9973	1.04 (0.6-1.79) 0.893	1.13 (0.79-1.63) 0.5042	1.2 (0.85-1.7) 0.2979	1.28 (0.82-2) 0.2785	1.4 (0.98-2) 0.0647	1.55 (0.79-3.04) 0.2003	1.35 (0.65-2.78) 0.4197	0.92 (0.65-1.3) 0.6339
rs8042149	1.5 (0.92-2.45) 0.1063	1.06 (0.74-1.54) 0.7392	1.39 (0.97-1.98) 0.0698	0.82 (0.46-1.47) 0.4994	0.86 (0.5-1.47) 0.5753	1 (0.67-1.5) 0.9844	1.01 (0.72-1.43) 0.9461	1.55 (1.01-2.4) **0.0466**	1.35 (0.94-1.95) 0.106	1.99 (0.99-4.02) 0.0536	1.84 (0.9-3.8) 0.0967	1.2 (0.85-1.71) 0.3039
rs4775301	1.6 (0.99-2.58) 0.0527	1 (0.68-1.49) 0.9801	1.41 (0.99-1.99) 0.0543	0.89 (0.5-1.59) 0.6954	0.94 (0.55-1.61) 0.8353	1.07 (0.73-1.55) 0.7348	1.16 (0.81-1.65) 0.4249	1.67 (1.08-2.56) **0.0199**	1.56 (1.08-2.25) **0.0173**	1.92 (0.96-3.83) 0.0645	1.79 (0.87-3.67) 0.1138	1.04 (0.73-1.47) 0.8287
rs11071561	1.47 (0.9-2.38) 0.1221	1.05 (0.73-1.52) 0.7948	1.25 (0.87-1.8) 0.218	1.1 (0.61-1.98) 0.7484	1.06 (0.61-1.84) 0.8277	1.03 (0.71-1.49) 0.8931	1.19 (0.83-1.71) 0.3375	1.61 (1.03-2.5) **0.0351**	1.51 (1.04-2.19) **0.0285**	1.87 (0.94-3.7) 0.0738	1.74 (0.83-3.64) 0.1434	0.94 (0.66-1.34) 0.7187

RORA	*NPSR1* rs323922	rs324384	rs324396	rs324957	rs740347	rs1419779	rs324981	rs325462	rs17789420	rs34705969	rs727162	rs6972158
rs17191582	0.86 (0.53-1.39) 0.529	1.06 (0.66-1.7) 0.8131	1.08 (0.66-1.76) 0.771	1.07 (0.66-1.73) 0.7968	1.38 (0.75-2.52) 0.2957	1.3 (0.79-2.12) 0.2979	0.83 (0.52-1.32) 0.4341	1.32 (0.83-2.11) 0.2459	1.01 (0.48-2.15) 0.9752	3.43 (0.86-13.62) 0.0796	0.9 (0.48-1.69) 0.7322	0.97 (0.59-1.59) 0.8978
rs6494221	0.79 (0.52-1.22) 0.292	1.17 (0.76-1.8) 0.4879	1.12 (0.71-1.76) 0.6172	1.21 (0.78-1.88) 0.3936	1.13 (0.68-1.88) 0.625	1.16 (0.75-1.79) 0.5047	0.82 (0.54-1.25) 0.3504	1.3 (0.85-1.98) 0.231	0.91 (0.48-1.7) 0.758	3.41 (0.89-13.08) 0.0734	0.9 (0.51-1.6) 0.7241	0.82 (0.52-1.31) 0.416
rs8043356	0.91 (0.52-1.58) 0.739	1.42 (0.83-2.42) 0.1983	1.14 (0.65-2.02) 0.6442	1.47 (0.87-2.5) 0.154	0.53 (0.23-1.23) 0.1422	0.62 (0.34-1.12) 0.11	0.74 (0.44-1.25) 0.2648	1.29 (0.77-2.17) 0.3342	0.5 (0.19-1.35) 0.1735	0.47 (0.1-2.23) 0.342	0.9 (0.47-1.75) 0.765	1.09 (0.63-1.9) 0.7461
rs12899193	0.82 (0.56-1.19) 0.2924	1.2 (0.83-1.75) 0.3278	1.1 (0.74-1.62) 0.646	1.23 (0.84-1.78) 0.2834	0.99 (0.61-1.59) 0.9522	1.03 (0.7-1.52) 0.8783	0.79 (0.55-1.13) 0.1952	1.25 (0.87-1.8) 0.2347	0.81 (0.45-1.44) 0.4754	1.49 (0.45-4.88) 0.5127	0.84 (0.53-1.36) 0.4859	1.09 (0.73-1.62) 0.6662
rs12909890	0.95 (0.65-1.38) 0.7937	1.04 (0.72-1.5) 0.8464	1.02 (0.68-1.53) 0.9321	1.06 (0.73-1.54) 0.7515	0.95 (0.59-1.55) 0.8511	1.14 (0.78-1.66) 0.5079	0.96 (0.68-1.37) 0.8353	1.11 (0.77-1.6) 0.5764	0.85 (0.48-1.52) 0.5849	2.62 (0.81-8.5) 0.1075	0.79 (0.49-1.29) 0.3486	1.03 (0.69-1.53) 0.895
rs8024629	0.85 (0.54-1.33) 0.4701	1.09 (0.71-1.7) 0.6849	1.01 (0.65-1.57) 0.9718	1.08 (0.7-1.68) 0.7311	1.05 (0.61-1.82) 0.8474	1.31 (0.85-2.01) 0.2202	0.88 (0.58-1.34) 0.5544	1.21 (0.78-1.85) 0.3967	0.85 (0.43-1.7) 0.6523	2.86 (0.84-9.7) 0.0928	1.28 (0.73-2.23) 0.386	1.01 (0.64-1.6) 0.9488
rs11635314	0.81 (0.46-1.4) 0.4459	1.58 (0.93-2.69) 0.0937	1.75 (0.99-3.12) 0.0557	1.57 (0.92-2.67) 0.0989	0.71 (0.32-1.55) 0.3837	0.52 (0.29-0.93) **0.0273**	0.63 (0.38-1.04) 0.0722	1.55 (0.92-2.61) 0.1013	0.42 (0.16-1.13) 0.086	6.33 (1.15-34.83) **0.034**	1.64 (0.85-3.13) 0.1375	0.5 (0.27-0.93) **0.0282**
rs4775289	1.06 (0.74-1.53) 0.7366	0.87 (0.6-1.25) 0.4479	0.75 (0.5-1.11) 0.1523	0.87 (0.6-1.25) 0.4534	1.67 (1.02-2.73) **0.041**	1.6 (1.09-2.32) **0.015**	0.98 (0.7-1.39) 0.9316	1.08 (0.76-1.53) 0.6755	1.33 (0.75-2.36) 0.3243	0.78 (0.31-1.97) 0.6009	1.05 (0.68-1.61) 0.8269	1.32 (0.89-1.96) 0.1617
rs17237367	0.98 (0.64-1.49) 0.9071	0.96 (0.61-1.49) 0.845	0.98 (0.62-1.56) 0.9361	0.94 (0.6-1.46) 0.7852	0.77 (0.42-1.4) 0.3902	0.78 (0.49-1.24) 0.2952	1.2 (0.78-1.85) 0.3971	0.87 (0.56-1.35) 0.5392	1.15 (0.6-2.2) 0.6741	1.12 (0.34-3.72) 0.8483	0.85 (0.49-1.47) 0.5626	0.95 (0.6-1.51) 0.8397
rs17191596	0.95 (0.57-1.58) 0.8421	1.06 (0.64-1.78) 0.8094	1.03 (0.61-1.73) 0.917	1.04 (0.63-1.74) 0.8683	1.22 (0.62-2.39) 0.5634	1.39 (0.85-2.28) 0.1903	0.87 (0.54-1.39) 0.548	1.29 (0.79-2.1) 0.3039	0.77 (0.34-1.76) 0.5392	2.94 (0.74-11.71) 0.1266	1.24 (0.68-2.26) 0.4757	0.79 (0.47-1.33) 0.3669
rs4775292	1.19 (0.82-1.71) 0.3667	0.75 (0.51-1.09) 0.1353	0.77 (0.5-1.19) 0.2437	0.75 (0.51-1.1) 0.1431	1.55 (0.92-2.61) 0.1018	1.33 (0.9-1.95) 0.1479	1.24 (0.86-1.77) 0.2468	0.83 (0.57-1.2) 0.3262	1.73 (0.97-3.08) 0.0622	0.46 (0.14-1.56) 0.2148	1.01 (0.64-1.58) 0.9654	1.59 (1.06-2.4) **0.0262**
rs17204367	0.92 (0.64-1.31) 0.6378	1.16 (0.82-1.65) 0.4012	1.1 (0.75-1.62) 0.623	1.16 (0.82-1.65) 0.4009	0.79 (0.48-1.32) 0.3732	0.89 (0.61-1.29) 0.5246	0.83 (0.59-1.16) 0.2787	1.14 (0.81-1.6) 0.4684	0.69 (0.39-1.23) 0.2125	1.3 (0.43-3.92) 0.6403	1.14 (0.73-1.78) 0.5622	0.62 (0.42-0.92) **0.0173**
rs17204395	0.81 (0.52-1.26) 0.3522	1.12 (0.72-1.74) 0.6116	0.87 (0.54-1.39) 0.5549	1.1 (0.71-1.72) 0.6745	0.93 (0.53-1.64) 0.806	1.2 (0.78-1.85) 0.4125	0.89 (0.59-1.35) 0.5867	1.21 (0.8-1.85) 0.3666	0.72 (0.36-1.44) 0.3477	2.71 (0.73-10.01) 0.1354	1.66 (0.96-2.84) 0.0674	0.67 (0.41-1.08) 0.0974
rs12437690	0.93 (0.65-1.32) 0.6826	1.3 (0.92-1.85) 0.1339	1.15 (0.79-1.67) 0.4592	1.27 (0.9-1.8) 0.1718	0.86 (0.52-1.4) 0.5346	0.89 (0.62-1.28) 0.5397	0.87 (0.62-1.22) 0.422	1.25 (0.89-1.75) 0.2	0.8 (0.46-1.41) 0.4425	2.82 (0.97-8.15) 0.0559	1.11 (0.72-1.72) 0.6352	0.65 (0.44-0.96) **0.0301**
rs9302215	0.95 (0.66-1.37) 0.7771	1.28 (0.9-1.84) 0.1699	1.08 (0.73-1.6) 0.689	1.25 (0.88-1.79) 0.2158	0.87 (0.53-1.44) 0.5893	0.85 (0.59-1.24) 0.4089	0.86 (0.61-1.21) 0.3905	1.21 (0.85-1.72) 0.2796	0.78 (0.43-1.39) 0.3927	3.15 (1.07-9.27) **0.0367**	1.32 (0.84-2.06) 0.2265	0.59 (0.39-0.89) **0.0116**
rs17204440	0.88 (0.61-1.25) 0.4634	1.38 (0.96-1.98) 0.0812	1.18 (0.79-1.76) 0.4127	1.33 (0.93-1.9) 0.1214	0.76 (0.46-1.26) 0.2927	0.74 (0.51-1.07) 0.1108	0.83 (0.59-1.17) 0.2961	1.24 (0.87-1.77) 0.2279	0.7 (0.39-1.25) 0.2305	2.8 (0.86-9.11) 0.0873	1.22 (0.79-1.89) 0.3753	0.71 (0.48-1.05) 0.0865
rs7164773	0.91 (0.64-1.3) 0.6104	0.9 (0.63-1.27) 0.5404	1.04 (0.71-1.53) 0.8384	0.89 (0.63-1.26) 0.5019	1.03 (0.64-1.66) 0.9031	1.11 (0.77-1.61) 0.5764	1.06 (0.75-1.5) 0.7325	0.86 (0.61-1.22) 0.3958	1.25 (0.73-2.16) 0.4146	0.29 (0.09-0.87) **0.0277**	0.8 (0.51-1.24) 0.3215	1.28 (0.87-1.9) 0.2116
rs10519067	0.78 (0.44-1.37) 0.3857	1.21 (0.69-2.1) 0.5043	1.25 (0.66-2.35) 0.4983	1.18 (0.68-2.07) 0.5532	0.58 (0.23-1.49) 0.2591	0.65 (0.35-1.2) 0.1682	0.94 (0.55-1.6) 0.814	1.03 (0.6-1.78) 0.9155	0.76 (0.28-2.01) 0.5744	0.67 (0.16-2.88) 0.5922	0.92 (0.46-1.83) 0.8167	1.48 (0.82-2.65) 0.1909
rs12438866	0.82 (0.57-1.19) 0.293	1.09 (0.75-1.57) 0.6585	0.98 (0.65-1.45) 0.9042	1.05 (0.73-1.52) 0.7754	0.74 (0.44-1.24) 0.2479	1.01 (0.68-1.5) 0.9649	1 (0.7-1.42) 0.9912	1.08 (0.75-1.55) 0.6916	0.64 (0.35-1.19) 0.1578	2.81 (0.83-9.52) 0.0964	1.25 (0.78-1.98) 0.3528	0.85 (0.57-1.25) 0.4103
rs17204454	1.1 (0.78-1.56) 0.5774	0.73 (0.51-1.03) 0.0763	0.83 (0.56-1.22) 0.3399	0.73 (0.51-1.04) 0.0825	1.23 (0.76-1.99) 0.4048	1.29 (0.89-1.86) 0.1801	1.21 (0.86-1.71) 0.2719	0.75 (0.53-1.07) 0.114	1.29 (0.74-2.26) 0.3676	0.4 (0.13-1.23) 0.1101	0.96 (0.63-1.47) 0.8446	1.37 (0.93-2.02) 0.1154
rs922782	0.84 (0.57-1.21) 0.3451	0.98 (0.67-1.43) 0.9134	0.93 (0.63-1.38) 0.7223	0.96 (0.66-1.4) 0.8353	1.16 (0.69-1.92) 0.5792	1.41 (0.97-2.05) 0.0752	0.97 (0.68-1.38) 0.8511	1.15 (0.8-1.65) 0.4596	0.91 (0.51-1.6) 0.7372	1.24 (0.47-3.29) 0.6618	1.26 (0.81-1.97) 0.3038	0.86 (0.59-1.27) 0.4566
rs7173227	1.39 (0.81-2.38) 0.2277	1.2 (0.72-2) 0.4827	1.37 (0.77-2.42) 0.2817	1.23 (0.72-2.09) 0.4429	1.36 (0.66-2.79) 0.4054	0.78 (0.45-1.35) 0.3737	1.06 (0.64-1.76) 0.8335	1.08 (0.65-1.81) 0.7559	1.16 (0.53-2.55) 0.7115	0.62 (0.1-3.78) 0.6077	0.64 (0.33-1.24) 0.1893	0.98 (0.57-1.68) 0.9414
rs2899662	1.3 (0.89-1.9) 0.1786	0.65 (0.44-0.96) **0.0317**	0.61 (0.4-0.95) **0.0277**	0.65 (0.44-0.96) **0.032**	1.51 (0.92-2.48) 0.1066	1.49 (1.01-2.2) **0.0438**	1.19 (0.82-1.73) 0.3535	0.75 (0.51-1.1) 0.1391	1.51 (0.84-2.72) 0.1712	0.34 (0.1-1.19) 0.0926	0.75 (0.47-1.19) 0.2263	1.51 (1-2.28) **0.0498**
rs341459	0.88 (0.6-1.31) 0.5415	0.98 (0.67-1.46) 0.938	0.94 (0.63-1.41) 0.7768	0.96 (0.65-1.42) 0.83	0.93 (0.56-1.56) 0.7954	1.24 (0.84-1.82) 0.2844	1.02 (0.71-1.47) 0.9112	0.98 (0.68-1.43) 0.9367	0.76 (0.42-1.39) 0.3722	3.06 (1.04-8.94) **0.0413**	1.53 (0.95-2.47) 0.0791	0.7 (0.47-1.06) 0.0907
rs10162630	0.66 (0.45-0.95) **0.0246**	1.34 (0.94-1.91) 0.1102	1.35 (0.91-2.01) 0.1349	1.34 (0.93-1.92) 0.1123	0.66 (0.4-1.06) 0.0857	0.88 (0.61-1.26) 0.4714	0.84 (0.6-1.17) 0.2967	1.2 (0.85-1.7) 0.3017	0.72 (0.42-1.25) 0.244	1.66 (0.59-4.61) 0.3348	1.39 (0.9-2.15) 0.1355	0.67 (0.45-1) **0.0488**
rs12591848	1.42 (0.77-2.61) 0.2594	1.35 (0.75-2.44) 0.3155	1.76 (0.93-3.36) 0.0843	1.35 (0.75-2.45) 0.316	0.81 (0.35-1.87) 0.6141	0.34 (0.17-0.68) **0.002**	0.9 (0.5-1.61) 0.7223	1.13 (0.63-2.04) 0.6749	0.79 (0.31-2) 0.615	1.51 (0.28-8.07) 0.63	0.78 (0.38-1.64) 0.5192	0.65 (0.34-1.25) 0.1973
rs7171681	1.38 (0.92-2.06) 0.1207	0.57 (0.37-0.87) **0.0086**	0.45 (0.28-0.73) **0.0013**	0.55 (0.36-0.84) **0.006**	1.81 (1.06-3.09) **0.0309**	1.71 (1.14-2.55) **0.009**	1.46 (0.99-2.17) 0.058	0.65 (0.43-0.98) **0.0408**	1.69 (0.91-3.12) 0.0943	0.42 (0.12-1.56) 0.1977	1.11 (0.69-1.78) 0.6757	1.72 (1.1-2.69) **0.0181**
rs7169281	0.96 (0.68-1.35) 0.8085	1.15 (0.81-1.62) 0.448	1.21 (0.83-1.76) 0.3185	1.1 (0.77-1.56) 0.5997	0.92 (0.56-1.5) 0.7306	0.79 (0.54-1.14) 0.2011	0.89 (0.63-1.24) 0.4831	1.09 (0.78-1.53) 0.6113	0.73 (0.42-1.29) 0.2804	1.18 (0.45-3.13) 0.7377	0.94 (0.62-1.43) 0.7715	0.75 (0.52-1.09) 0.1293
rs10152719	0.66 (0.41-1.07) 0.0936	1.43 (0.9-2.26) 0.134	1.57 (0.93-2.67) 0.0942	1.52 (0.97-2.4) 0.0706	0.48 (0.22-1.05) 0.0657	0.7 (0.42-1.16) 0.1649	0.81 (0.51-1.28) 0.3555	1.22 (0.78-1.92) 0.3889	0.71 (0.31-1.62) 0.4147	2.03 (0.57-7.26) 0.2784	1.05 (0.61-1.83) 0.854	1.09 (0.65-1.83) 0.7554
rs341382	1.23 (0.81-1.86) 0.3411	0.67 (0.44-1.04) 0.074	0.52 (0.32-0.85) **0.0094**	0.66 (0.43-1.02) 0.0608	1.45 (0.82-2.55) 0.197	1.54 (1.01-2.35) **0.0448**	1.32 (0.88-1.99) 0.1829	0.76 (0.5-1.16) 0.1982	1.65 (0.88-3.07) 0.1175	0.48 (0.13-1.73) 0.2608	1.16 (0.71-1.87) 0.5569	1.7 (1.08-2.67) **0.0215**
rs341392	0.94 (0.62-1.44) 0.7823	1.01 (0.66-1.57) 0.9465	1.14 (0.72-1.79) 0.588	1.07 (0.71-1.63) 0.7375	0.85 (0.46-1.58) 0.6173	0.88 (0.57-1.36) 0.5576	0.99 (0.66-1.48) 0.9481	0.95 (0.63-1.42) 0.7925	0.98 (0.49-1.94) 0.9499	1.16 (0.33-4.1) 0.8224	1.05 (0.63-1.74) 0.8529	0.99 (0.63-1.58) 0.9766
rs6494229	1.02 (0.72-1.45) 0.8979	0.82 (0.58-1.17) 0.2714	0.71 (0.48-1.04) 0.0762	0.85 (0.6-1.21) 0.3763	1.06 (0.64-1.78) 0.8161	1.34 (0.92-1.96) 0.1248	1.25 (0.88-1.76) 0.2121	0.81 (0.57-1.15) 0.2294	1.42 (0.79-2.56) 0.2377	0.96 (0.35-2.65) 0.942	1.18 (0.77-1.8) 0.4547	1.56 (1.07-2.27) **0.0207**
rs8042149	1.51 (1.06-2.17) **0.0234**	0.6 (0.42-0.86) **0.0059**	0.62 (0.42-0.92) **0.0165**	0.62 (0.43-0.89) **0.0101**	1.3 (0.8-2.13) 0.285	1.59 (1.09-2.32) **0.0165**	1.63 (1.15-2.31) **0.0058**	0.64 (0.45-0.91) **0.0139**	1.6 (0.91-2.81) 0.1052	1.34 (0.45-3.94) 0.5982	1.19 (0.78-1.83) 0.4185	1.28 (0.87-1.87) 0.2097
rs4775301	1.31 (0.92-1.86) 0.132	0.63 (0.44-0.9) **0.0116**	0.65 (0.44-0.96) **0.0307**	0.65 (0.46-0.94) **0.0202**	1.33 (0.82-2.17) 0.2476	1.81 (1.23-2.65) **0.0024**	1.61 (1.14-2.27) **0.0072**	0.65 (0.46-0.93) **0.0183**	1.63 (0.94-2.82) 0.082	1.23 (0.4-3.74) 0.7176	1.12 (0.73-1.72) 0.5953	1.28 (0.87-1.88) 0.2107
rs11071561	1.13 (0.79-1.62) 0.5045	0.71 (0.49-1.02) 0.0619	0.71 (0.48-1.06) 0.0942	0.74 (0.52-1.06) 0.1017	1.11 (0.67-1.85) 0.6882	1.57 (1.07-2.29) **0.021**	1.51 (1.07-2.13) **0.02**	0.72 (0.5-1.02) 0.0647	1.7 (0.95-3.04) 0.0738	0.99 (0.34-2.87) 0.9785	1.06 (0.69-1.64) 0.7962	1.4 (0.94-2.08) 0.0957

Supplementary Table S6. Complete replication results of RORA*NPSR1 interactions on nocturnal asthma in BAMSE and MAAS.

effect direction different to MAGICS/ISAAC
effect direction the same as in MAGICS/ISAAC
borderline significant replication
significant replication of interaction on nocturnal asthma

NPSR1	*RORA*	nocturnal asthma (MAGICS/ISAAC)	nocturnal breathing difficulties (BAMSE)	nocturnal symptoms at age 11 (MAAS)
rs2609234	rs4775289	1.92 (1.11-3.32) **0.0193**	na	1.28 (0.74-2.2) 0.3733
	rs4775292	1.78 (1.05-3.01) **0.0326**	na	1.56 (0.86-2.84) 0.1449
	rs12437690	0.56 (0.34-0.95) **0.031**	na	0.69 (0.39-1.23) 0.2076
	rs7171681	1.99 (1.17-3.39) **0.0117**	na	1.72 (0.89-3.32) 0.1057
	rs341382	1.74 (1.03-2.93) **0.0376**	na	1.88 (0.96-3.7) 0.0675
rs2530547	rs4775289	1.51 (1.03-2.2) **0.0332**	0.98 (0.68-1.43) 0.9296	1.37 (0.84-2.22) 0.2068
	rs12591848 †	0.49 (0.27-0.9) **0.0216**	0.77 (0.44-1.32) 0.3357 ‡	1.03 (0.46-2.28) 0.9504
	rs7171681	1.54 (1.01-2.36) **0.0446**	1.04 (0.7-1.55) 0.8428 ‡	1.1 (0.61-1.97) 0.7497
rs1379928	rs8043356	0.41 (0.2-0.87) **0.0201**	1 (0.55-1.8) 0.995	0.75 (0.37-1.53) 0.4323
	rs4775292	1.68 (1.08-2.6) **0.02**	1.23 (0.76-1.97) 0.3974 ‡	**2.11 (1.16-3.84) 0.0143**
	rs12437690	0.62 (0.39-0.97) **0.036**	0.86 (0.54-1.37) 0.5355 ‡	**0.53 (0.3-0.93) 0.0254**
	rs17204454	1.59 (1.04-2.43) **0.0318**	1.11 (0.71-1.75) 0.644 ‡	**1.99 (1.14-3.46) 0.0149**
	rs7171681	1.69 (1.06-2.68) **0.0262**	1.16 (0.7-1.93) 0.5688 ‡	0.98 (0.52-1.87) 0.9594
	rs341382	1.73 (1.07-2.77) **0.0243**	1.27 (0.75-2.16) 0.3736 ‡	1.06 (0.54-2.06) 0.8696
	rs8042149	1.55 (1.01-2.4) **0.0466**	0.89 (0.56-1.41) 0.6139	0.99 (0.6-1.62) 0.9658
	rs4775301	1.67 (1.08-2.56) **0.0199**	0.96 (0.61-1.52) 0.8707	1 (0.6-1.67) 0.9961
	rs11071561	1.61 (1.03-2.5) **0.0351**	0.98 (0.62-1.56) 0.9332	0.87 (0.49-1.55) 0.635
rs963218	rs11635314	0.57 (0.33-0.98) **0.0434**	0.79 (0.47-1.33) 0.3752 ‡	0.79 (0.42-1.51) 0.48
	rs4775289	1.66 (1.15-2.39) **0.0063**	1.25 (0.86-1.81) 0.2393 ‡	1.1 (0.71-1.72) 0.6672
	rs12591848 †	0.46 (0.25-0.84) **0.0108**	0.6 (0.35-1.05) 0.0759 ‡	0.77 (0.37-1.6) 0.4834
	rs7171681	1.85 (1.24-2.77) **0.0028**	1.23 (0.84-1.8) 0.2797 ‡	1.08 (0.63-1.84) 0.7787
	rs341382	1.8 (1.18-2.75) **0.0063**	1.21 (0.82-1.8) 0.3422 ‡	1.4 (0.81-2.43) 0.2333
	rs4775301	1.56 (1.08-2.25) **0.0173**	0.92 (0.64-1.31) 0.6361	1 (0.63-1.58) 0.9862
	rs11071561	1.51 (1.04-2.19) **0.0285**	1.07 (0.75-1.53) 0.7193 ‡	1.22 (0.75-1.97) 0.4257
rs324384	rs2899662	0.65 (0.44-0.96) **0.0317**	0.97 (0.67-1.41) 0.8682 ‡	**0.6 (0.36-0.98) 0.0395**
	rs7171681	0.57 (0.37-0.87) **0.0086**	0.88 (0.59-1.3) 0.5256 ‡	0.84 (0.49-1.46) 0.5349
	rs8042149	0.6 (0.42-0.86) **0.0059**	1.07 (0.75-1.52) 0.725	0.93 (0.6-1.46) 0.7683
	rs4775301	0.63 (0.44-0.9) **0.0116**	1.01 (0.71-1.45) 0.9567	0.87 (0.55-1.36) 0.5365
rs324396	rs2899662	0.61 (0.4-0.95) **0.0277**	0.73 (0.49-1.1) 0.1309 ‡	**0.48 (0.28-0.82) 0.0069**

	rs7171681	0.45 (0.28-0.73) **0.0013**	0.82 (0.54-1.24) 0.3384 ‡	**0.54 (0.3-0.99) 0.0459**
	rs341382	0.52 (0.32-0.85) **0.0094**	0.9 (0.58-1.4) 0.649 ‡	0.58 (0.31-1.07) 0.0825
	rs8042149	0.62 (0.42-0.92) **0.0165**	0.91 (0.62-1.33) 0.6339 ‡	0.68 (0.42-1.1) 0.1122
	rs4775301	0.65 (0.44-0.96) **0.0307**	0.87 (0.6-1.28) 0.4886 ‡	0.63 (0.38-1.03) 0.065
rs324957	rs2899662	0.65 (0.44-0.96) **0.032**	na	**0.56 (0.34-0.91) 0.02**
	rs7171681	0.55 (0.36-0.84) **0.006**	na	0.8 (0.46-1.39) 0.4285
	rs8042149	0.62 (0.43-0.89) **0.0101**	na	0.84 (0.54-1.32) 0.4562
	rs4775301	0.65 (0.46-0.94) **0.0202**	na	0.78 (0.5-1.23) 0.2826
rs1419779	rs11635314	0.52 (0.29-0.93) **0.0273**	na	0.69 (0.37-1.3) 0.2551
	rs4775289	1.6 (1.09-2.32) **0.015**	na	1.17 (0.74-1.85) 0.5094
	rs2899662	1.49 (1.01-2.2) **0.0438**	na	1.16 (0.71-1.91) 0.5523
	rs12591848 †	0.34 (0.17-0.68) **0.002**	na	0.65 (0.32-1.34) 0.2474
	rs7171681	1.71 (1.14-2.55) **0.009**	na	0.9 (0.51-1.58) 0.7031
	rs341382	1.54 (1.01-2.35) **0.0448**	na	1.09 (0.61-1.94) 0.7805
	rs8042149	1.59 (1.09-2.32) **0.0165**	na	0.9 (0.57-1.43) 0.6584
	rs4775301	1.81 (1.23-2.65) **0.0024**	na	0.9 (0.56-1.45) 0.67
	rs11071561	1.57 (1.07-2.29) **0.021**	na	0.92 (0.55-1.52) 0.7322
rs324981	rs8042149	1.63 (1.15-2.31) **0.0058**	na	1.21 (0.79-1.84) 0.3789
	rs4775301	1.61 (1.14-2.27) **0.0072**	na	1.19 (0.78-1.82) 0.4243
	rs11071561	1.51 (1.07-2.13) **0.02**	na	1.57 (0.99-2.5) 0.0577
rs325462	rs7171681	0.65 (0.43-0.98) **0.0408**	na	0.77 (0.46-1.29) 0.3274
	rs8042149	0.64 (0.45-0.91) **0.0139**	na	0.87 (0.56-1.34) 0.5197
	rs4775301	0.65 (0.46-0.93) **0.0183**	na	0.87 (0.56-1.35) 0.542
rs34705969	rs11635314	6.33 (1.15-34.83) **0.034**	1.87 (0.63-5.61) 0.2613 ‡	0.43 (0.06-2.87) 0.385
	rs9302215	3.15 (1.07-9.27) **0.0367**	0.8 (0.28-2.28) 0.6817	0.69 (0.19-2.54) 0.5802
	rs7164773	0.29 (0.09-0.87) **0.0277**	0.62 (0.22-1.7) 0.35 ‡	0.96 (0.19-4.72) 0.955
	rs341459	3.06 (1.04-8.94) **0.0413**	0.73 (0.26-2.06) 0.5498	1.18 (0.28-4.95) 0.8239
rs6972158	rs11635314	0.5 (0.27-0.93) **0.0282**	0.7 (0.4-1.23) 0.2181 ‡	1.25 (0.67-2.32) 0.4849
	rs4775292	1.59 (1.06-2.4) **0.0262**	1.19 (0.8-1.77) 0.4038 ‡	0.8 (0.49-1.32) 0.3871
	rs17204367	0.62 (0.42-0.92) **0.0173**	0.9 (0.59-1.37) 0.6269 ‡	1.15 (0.72-1.82) 0.5611
	rs12437690	0.65 (0.44-0.96) **0.0301**	0.89 (0.61-1.31) 0.5593 ‡	1.29 (0.81-2.07) 0.2886
	rs9302215	0.59 (0.39-0.89) **0.0116**	0.9 (0.61-1.33) 0.5844 ‡	1.28 (0.8-2.05) 0.2977
	rs2899662	1.51 (1-2.28) **0.0498**	1.21 (0.82-1.81) 0.3401 ‡	1.12 (0.68-1.85) 0.6528
	rs10162630	0.67 (0.45-1) **0.0488**	1.03 (0.71-1.51) 0.871	0.95 (0.59-1.5) 0.8124
	rs7171681	1.72 (1.1-2.69) **0.0181**	1.19 (0.78-1.8) 0.4184 ‡	0.82 (0.47-1.45) 0.4976
	rs341382	1.7 (1.08-2.67) **0.0215**	1.35 (0.87-2.09) 0.174 ‡	0.93 (0.52-1.65) 0.7967
	rs6494229	1.56 (1.07-2.27) **0.0207**	0.84 (0.57-1.22) 0.3518	0.75 (0.45-1.23) 0.2505
rs714588	rs4775289	1.61 (1.13-2.29) **0.008**	0.86 (0.59-1.24) 0.4167	1.02 (0.65-1.61) 0.929

rs887020		1.53 (1.06-2.23) **0.0249**	1.11 (0.76-1.63) 0.5807 ‡	0.99 (0.64-1.54) 0.9759
rs740347		1.67 (1.02-2.73) **0.041**	1.65 (0.97-2.8) 0.0646 ‡	1.03 (0.56-1.92) 0.9164
rs1345267	rs10162630	0.63 (0.44-0.91) **0.0145**	na	0.84 (0.53-1.33) 0.4518
rs323922		0.66 (0.45-0.95) **0.0246**	0.87 (0.61-1.24) 0.4534 ‡	0.74 (0.48-1.14) 0.1743
rs714588	rs12591848 †	0.53 (0.29-0.98) **0.0415**	0.66 (0.38-1.16) 0.1465 ‡	0.98 (0.46-2.09) 0.958
rs887020		0.44 (0.24-0.81) **0.0089**	0.71 (0.4-1.25) 0.2323 ‡	0.82 (0.37-1.8) 0.615
rs740347	rs7171681	1.81 (1.06-3.09) **0.0309**	1.71 (0.99-2.95) 0.0546 ‡	0.75 (0.35-1.64) 0.4749
rs323922	rs8042149	1.51 (1.06-2.17) **0.0234**	0.89 (0.62-1.28) 0.5417	1.22 (0.79-1.88) 0.381

Supplementary Table S7. Validation of RORA*NPSR1 interaction results on nocturnal asthma in MAAS at age 16.

effect direction different than at age 11
effect direction the same as at age 11
borderline significant validation
significant validation of interaction effect on nocturnal asthma at age 16

NPSR1	***RORA***	**Nocturnal symptoms at age 11** (MAAS)	**Nocturnal symptoms at age 16** (MAAS)
rs2609234	rs341382	1.88 (0.96-3.7) 0.0675	1.84 (0.76-4.42) 0.1747
rs1379928	rs4775292	**2.11 (1.16-3.84) 0.0143**	2.34 (1-5.49) 0.0505
	rs12437690	**0.53 (0.3-0.93) 0.0254**	0.86 (0.4-1.83) 0.6917
	rs17204454	**1.99 (1.14-3.46) 0.0149**	1.87 (0.87-4.01) 0.11
rs324384	rs2899662	**0.6 (0.36-0.98) 0.0395**	0.55 (0.28-1.1) 0.0912
rs324396	rs2899662	**0.48 (0.28-0.82) 0.0069**	**0.4 (0.18-0.86) 0.0194**
	rs7171681	**0.54 (0.3-0.99) 0.0459**	0.48 (0.2-1.12) 0.0901
	rs341382	0.58 (0.31-1.07) 0.0825	**0.38 (0.15-0.95) 0.0384**
	rs4775301	0.63 (0.38-1.03) 0.065	0.83 (0.4-1.71) 0.6142
rs324957	rs2899662	**0.56 (0.34-0.91) 0.02**	0.53 (0.26-1.05) 0.0675
rs324981	rs11071561	1.57 (0.99-2.5) 0.0577	1.3 (0.69-2.46) 0.4219

Supplementary Table S8. Interaction results of *RORA* * *NPSR1*-SNPs on asthma without nocturnal symptoms in MAGICS/ISAAC.

	NPSR1											
RORA	rs2609234	rs1006392	rs714588	rs1963499	rs2168890	rs2530547	rs887020	rs1379928	rs963218	rs2609215	rs323917	rs1345267
rs17191582	0.9 (0.48-1.71) 0.7532	0.94 (0.58-1.53) 0.8189	1.12 (0.7-1.79) 0.6417	0.79 (0.34-1.87) 0.597	0.57 (0.26-1.27) 0.1712	0.72 (0.43-1.21) 0.209	0.92 (0.57-1.49) 0.7474	0.86 (0.5-1.47) 0.5823	0.86 (0.54-1.38) 0.5447	0.71 (0.31-1.63) 0.417	0.53 (0.17-1.67) 0.2797	0.97 (0.59-1.57) 0.8945
rs6494221	0.85 (0.47-1.56) 0.6038	0.67 (0.43-1.03) 0.0687	1.11 (0.75-1.66) 0.5969	0.83 (0.4-1.71) 0.6119	0.59 (0.3-1.15) 0.1206	0.85 (0.54-1.32) 0.4651	1 (0.67-1.5) 0.9806	0.99 (0.64-1.54) 0.9635	0.92 (0.61-1.37) 0.669	0.72 (0.34-1.53) 0.3958	0.7 (0.27-1.81) 0.4666	1.03 (0.69-1.54) 0.8663
rs8043356	0.71 (0.38-1.3) 0.2678	0.61 (0.38-0.99) **0.0459**	1.31 (0.82-2.08) 0.2536	1.17 (0.55-2.48) 0.6916	0.88 (0.44-1.77) 0.7202	1.34 (0.81-2.22) 0.2565	1.1 (0.69-1.77) 0.6862	0.73 (0.43-1.23) 0.2368	1.02 (0.65-1.59) 0.9414	0.78 (0.32-1.86) 0.5712	0.95 (0.35-2.55) 0.9153	1.21 (0.75-1.97) 0.4311
rs12899193	0.88 (0.56-1.38) 0.5711	0.76 (0.53-1.07) 0.1155	1.15 (0.82-1.61) 0.4047	0.97 (0.53-1.77) 0.9229	0.74 (0.44-1.27) 0.2791	0.97 (0.67-1.42) 0.8906	1.02 (0.72-1.46) 0.9009	0.89 (0.61-1.31) 0.5626	0.97 (0.69-1.36) 0.8492	0.68 (0.36-1.29) 0.2353	0.71 (0.32-1.55) 0.3879	1.11 (0.79-1.57) 0.5518
rs12909890	0.77 (0.49-1.22) 0.268	0.9 (0.64-1.28) 0.5648	0.95 (0.69-1.32) 0.7697	0.81 (0.45-1.47) 0.4869	0.71 (0.41-1.21) 0.2084	0.87 (0.6-1.26) 0.4533	0.91 (0.65-1.28) 0.5923	0.83 (0.56-1.23) 0.3563	0.99 (0.71-1.38) 0.9421	0.93 (0.49-1.76) 0.8169	1.01 (0.5-2.06) 0.9715	1.06 (0.75-1.5) 0.73
rs8024629	1.01 (0.56-1.8) 0.9786	0.89 (0.56-1.41) 0.6139	0.98 (0.64-1.5) 0.9147	0.79 (0.34-1.84) 0.5878	0.71 (0.34-1.48) 0.3635	0.78 (0.48-1.28) 0.3323	1.01 (0.63-1.61) 0.9733	1.32 (0.82-2.14) 0.2572	1.01 (0.66-1.57) 0.95	0.68 (0.29-1.56) 0.363	0.83 (0.31-2.23) 0.7131	1.27 (0.8-2.02) 0.3123
rs11635314	0.56 (0.29-1.07) 0.0789	1.14 (0.71-1.84) 0.5823	0.95 (0.61-1.48) 0.8115	0.42 (0.16-1.09) 0.0735	0.39 (0.17-0.9) **0.0282**	0.73 (0.45-1.19) 0.2127	0.68 (0.43-1.1) 0.115	0.64 (0.37-1.11) 0.11	0.67 (0.43-1.06) 0.0861	0.81 (0.32-2.07) 0.6565	1.17 (0.46-2.99) 0.7413	1.45 (0.88-2.38) 0.1457
rs4775289	1.15 (0.73-1.81) 0.5587	0.91 (0.66-1.26) 0.5745	1.22 (0.89-1.66) 0.2109	0.98 (0.58-1.67) 0.9525	0.83 (0.51-1.34) 0.4425	1.14 (0.81-1.59) 0.454	1.32 (0.95-1.82) 0.0937	1.2 (0.83-1.73) 0.3252	1.35 (0.99-1.85) 0.0575	0.77 (0.43-1.36) 0.3624	0.57 (0.28-1.14) 0.113	1.12 (0.82-1.53) 0.4904
rs17237367	1.25 (0.77-2.03) 0.3619	0.82 (0.57-1.18) 0.2886	0.89 (0.63-1.26) 0.5107	0.76 (0.42-1.37) 0.3597	0.94 (0.55-1.61) 0.8288	0.92 (0.62-1.36) 0.6768	1.1 (0.76-1.59) 0.6143	1.13 (0.75-1.71) 0.5562	1.05 (0.72-1.51) 0.8103	1.03 (0.55-1.93) 0.9186	1.51 (0.73-3.09) 0.2646	0.98 (0.69-1.41) 0.9276
rs17191596	0.95 (0.46-1.96) 0.8892	1.05 (0.61-1.8) 0.8593	0.94 (0.56-1.59) 0.8265	0.8 (0.3-2.16) 0.6583	0.95 (0.41-2.19) 0.9065	0.68 (0.37-1.24) 0.2083	0.78 (0.46-1.33) 0.363	1.23 (0.69-2.19) 0.4804	0.94 (0.56-1.58) 0.8206	0.82 (0.31-2.16) 0.6863	1.01 (0.3-3.42) 0.9834	1.04 (0.59-1.83) 0.8998
rs4775292	1.11 (0.72-1.73) 0.6394	0.89 (0.64-1.23) 0.4773	1.16 (0.84-1.59) 0.3701	0.76 (0.45-1.28) 0.3074	0.68 (0.43-1.08) 0.0983	1.13 (0.8-1.6) 0.4829	1.37 (0.98-1.91) 0.0654	1.13 (0.8-1.6) 0.4935	1.32 (0.96-1.81) 0.0846	0.75 (0.44-1.27) 0.2878	0.45 (0.22-0.93) **0.0318**	1.03 (0.75-1.41) 0.8578
rs17204367	0.98 (0.66-1.47) 0.9404	1.03 (0.75-1.42) 0.8475	0.93 (0.69-1.26) 0.6572	1.15 (0.69-1.94) 0.5909	1.31 (0.83-2.07) 0.2466	0.92 (0.65-1.3) 0.6351	0.89 (0.64-1.22) 0.4565	1.12 (0.78-1.59) 0.5419	0.8 (0.58-1.1) 0.1692	1.31 (0.77-2.24) 0.3166	1.52 (0.8-2.89) 0.1985	0.99 (0.72-1.36) 0.9567
rs17204395	0.91 (0.5-1.68) 0.773	1.37 (0.91-2.06) 0.133	0.79 (0.53-1.18) 0.251	1.08 (0.53-2.22) 0.8299	1.36 (0.76-2.45) 0.306	0.9 (0.58-1.4) 0.6309	0.88 (0.59-1.31) 0.5204	1.26 (0.82-1.95) 0.2959	1 (1-1) 0.9989	1.25 (0.65-2.39) 0.5096	2.74 (1.11-6.75) **0.0285**	0.72 (0.47-1.1) 0.1242
rs12437690	0.77 (0.51-1.16) 0.2052	1.13 (0.83-1.54) 0.4243	0.81 (0.6-1.09) 0.1567	0.57 (0.32-0.99) **0.0468**	0.69 (0.42-1.13) 0.1388	0.79 (0.57-1.09) 0.155	0.8 (0.59-1.08) 0.143	0.92 (0.65-1.3) 0.6181	0.79 (0.59-1.08) 0.14	1.06 (0.62-1.84) 0.821	1.9 (0.99-3.66) 0.0543	1.16 (0.84-1.61) 0.3556
rs9302215	0.77 (0.48-1.25) 0.2937	1.16 (0.83-1.6) 0.3841	0.89 (0.64-1.22) 0.4534	0.63 (0.35-1.13) 0.1238	0.72 (0.43-1.19) 0.2016	0.71 (0.5-1.01) 0.0565	0.75 (0.54-1.04) 0.0819	0.94 (0.66-1.34) 0.7307	0.76 (0.56-1.05) 0.0944	1.08 (0.62-1.88) 0.7965	2.05 (1.04-4.03) **0.037**	1.1 (0.79-1.54) 0.5691
rs17204440	0.79 (0.54-1.16) 0.2247	1.24 (0.91-1.7) 0.1763	0.82 (0.61-1.11) 0.201	0.95 (0.56-1.6) 0.8397	1 (0.6-1.66) 0.9938	0.82 (0.6-1.14) 0.2428	0.79 (0.58-1.08) 0.1453	0.93 (0.66-1.3) 0.6573	0.84 (0.62-1.14) 0.2644	1.19 (0.7-2.02) 0.5121	2.22 (1.11-4.43) **0.0234**	1.02 (0.74-1.39) 0.9063
rs7164773	1.25 (0.8-1.96) 0.3308	0.94 (0.69-1.28) 0.6944	1.23 (0.91-1.66) 0.1707	1.72 (0.99-2.99) 0.0529	1.62 (0.99-2.64) 0.0548	1.34 (0.96-1.88) 0.0876	1.29 (0.95-1.75) 0.1063	1.05 (0.75-1.47) 0.7622	1.22 (0.9-1.64) 0.1975	0.93 (0.54-1.62) 0.7966	0.48 (0.24-0.93) **0.0304**	0.83 (0.6-1.13) 0.2322
rs10519067	0.93 (0.49-1.76) 0.8126	1.13 (0.69-1.85) 0.6334	1 (0.58-1.73) 0.9971	1.53 (0.75-3.13) 0.2462	1.48 (0.77-2.85) 0.2427	1 (0.62-1.62) 0.9836	1.1 (0.7-1.71) 0.6792	0.96 (0.57-1.61) 0.8833	1.14 (0.73-1.8) 0.5593	1.22 (0.54-2.75) 0.6333	1.47 (0.62-3.48) 0.3826	0.93 (0.57-1.51) 0.769
rs12438866	0.86 (0.57-1.3) 0.4763	1.2 (0.88-1.65) 0.2545	0.83 (0.61-1.13) 0.2345	1.02 (0.61-1.72) 0.9289	1.2 (0.77-1.89) 0.4209	0.91 (0.65-1.29) 0.6035	0.89 (0.64-1.22) 0.4625	1.08 (0.76-1.54) 0.6591	1.05 (0.77-1.43) 0.7578	1.36 (0.81-2.3) 0.2445	2.52 (1.23-5.16) **0.0117**	0.88 (0.63-1.23) 0.4574
rs17204454	1.18 (0.78-1.79) 0.4384	0.79 (0.58-1.08) 0.1369	1.15 (0.85-1.55) 0.3799	1.12 (0.68-1.87) 0.6499	1.02 (0.66-1.58) 0.9258	1.34 (0.95-1.88) 0.0908	1.25 (0.91-1.7) 0.1614	1.05 (0.76-1.46) 0.7657	1.18 (0.88-1.59) 0.2683	0.77 (0.46-1.28) 0.3092	0.29 (0.13-0.61) **0.0012**	0.93 (0.68-1.26) 0.6334
rs922782	0.9 (0.6-1.35) 0.611	1.17 (0.86-1.58) 0.3289	0.88 (0.65-1.19) 0.3916	0.64 (0.37-1.12) 0.1197	0.79 (0.49-1.26) 0.3217	0.96 (0.69-1.33) 0.7928	1.01 (0.75-1.37) 0.9437	1.07 (0.75-1.53) 0.7121	1.11 (0.82-1.51) 0.4882	0.76 (0.44-1.31) 0.3226	0.49 (0.24-1.01) 0.052	0.86 (0.62-1.18) 0.3513
rs7173227	1.25 (0.69-2.27) 0.4689	1.15 (0.74-1.79) 0.5381	1.03 (0.66-1.61) 0.8927	0.91 (0.45-1.84) 0.7898	0.89 (0.46-1.72) 0.7331	0.68 (0.42-1.1) 0.118	0.81 (0.52-1.25) 0.3314	1.08 (0.66-1.77) 0.7658	0.75 (0.48-1.16) 0.1946	1.22 (0.58-2.55) 0.5939	2.25 (0.92-5.5) 0.075	1.71 (1.06-2.77) **0.0292**
rs2899662	1.16 (0.77-1.73) 0.4785	0.77 (0.55-1.08) 0.1368	1.2 (0.88-1.63) 0.2508	0.75 (0.43-1.33) 0.3304	0.7 (0.43-1.16) 0.1678	1.12 (0.8-1.57) 0.5134	1.35 (0.97-1.88) 0.078	1.04 (0.72-1.5) 0.8458	1.36 (0.99-1.89) 0.0608	0.62 (0.34-1.12) 0.1143	0.27 (0.12-0.61) **0.0016**	1.32 (0.96-1.81) 0.0875
rs341459	0.83 (0.53-1.31) 0.4313	1.32 (0.95-1.84) 0.0956	0.74 (0.53-1.02) 0.0662	0.87 (0.48-1.58) 0.6469	1.04 (0.62-1.75) 0.8734	0.81 (0.57-1.15) 0.2444	0.86 (0.62-1.18) 0.3541	1.12 (0.77-1.62) 0.567	0.88 (0.64-1.22) 0.4386	1.35 (0.76-2.41) 0.3035	1.49 (0.7-3.14) 0.2988	0.73 (0.52-1.02) 0.0681
rs10162630	1.06 (0.68-1.66) 0.7801	1.23 (0.89-1.71) 0.2158	0.94 (0.68-1.29) 0.6938	1.42 (0.83-2.45) 0.2024	1.53 (0.95-2.48) 0.0798	0.89 (0.63-1.26) 0.5168	0.93 (0.67-1.28) 0.6387	1.02 (0.72-1.43) 0.9227	0.87 (0.64-1.18) 0.3732	1.63 (0.93-2.89) 0.0905	2.43 (1.16-5.08) **0.0187**	0.65 (0.47-0.9) **0.0087**
rs12591848	0.76 (0.37-1.57) 0.4654	1.08 (0.64-1.83) 0.7625	1.01 (0.59-1.72) 0.968	0.7 (0.29-1.65) 0.4107	0.65 (0.29-1.43) 0.2835	0.59 (0.34-1.03) 0.0653	0.72 (0.42-1.22) 0.2264	0.85 (0.48-1.49) 0.5633	0.61 (0.37-1) **0.0498**	0.68 (0.27-1.73) 0.4178	1.26 (0.46-3.46) 0.6529	1.61 (0.94-2.77) 0.0839
rs7171681	1.14 (0.73-1.78) 0.5773	0.99 (0.7-1.41) 0.9714	0.98 (0.7-1.37) 0.9029	1.04 (0.61-1.75) 0.8946	0.83 (0.51-1.35) 0.4593	1.16 (0.81-1.66) 0.4171	1.12 (0.79-1.59) 0.507	1.19 (0.82-1.71) 0.3563	1.24 (0.89-1.74) 0.2106	0.79 (0.45-1.4) 0.4213	0.6 (0.3-1.21) 0.1565	1.17 (0.84-1.62) 0.3499
rs7169281	0.92 (0.63-1.34) 0.6486	1.09 (0.81-1.48) 0.5683	0.96 (0.71-1.28) 0.7655	0.9 (0.55-1.45) 0.6565	1.15 (0.75-1.77) 0.526	1 (0.72-1.37) 0.9804	0.94 (0.7-1.27) 0.7022	0.97 (0.69-1.36) 0.8493	0.92 (0.68-1.25) 0.599	0.96 (0.58-1.6) 0.8843	1.15 (0.62-2.13) 0.6622	0.77 (0.57-1.04) 0.0834
rs10152719	0.8 (0.46-1.4) 0.4317	0.91 (0.59-1.4) 0.6705	1.12 (0.76-1.65) 0.5738	1.3 (0.64-2.62) 0.4645	1.23 (0.66-2.29) 0.5136	1.15 (0.76-1.73) 0.5201	1.01 (0.68-1.51) 0.9498	0.74 (0.45-1.2) 0.2215	0.95 (0.63-1.44) 0.8234	1.68 (0.76-3.7) 0.2002	0.9 (0.38-2.14) 0.8075	0.98 (0.65-1.48) 0.9375
rs341382	1.12 (0.74-1.7) 0.5898	1.03 (0.73-1.45) 0.8664	0.93 (0.66-1.31) 0.6801	0.93 (0.54-1.6) 0.7831	0.71 (0.43-1.19) 0.1956	0.84 (0.58-1.21) 0.3533	1.03 (0.72-1.47) 0.8888	1.14 (0.78-1.67) 0.4965	1.06 (0.75-1.52) 0.7284	0.68 (0.38-1.24) 0.2137	0.51 (0.24-1.09) 0.0808	1.37 (0.97-1.94) 0.0725
rs341392	1.04 (0.67-1.63) 0.8532	0.8 (0.55-1.17) 0.2495	1.3 (0.91-1.85) 0.1474	1.38 (0.78-2.43) 0.2631	1.28 (0.76-2.16) 0.3495	1.41 (0.97-2.04) 0.0687	1.25 (0.88-1.78) 0.2208	0.88 (0.59-1.32) 0.5422	1.25 (0.86-1.8) 0.2362	1.6 (0.84-3.04) 0.1539	1.44 (0.72-2.85) 0.3004	0.85 (0.58-1.23) 0.3817
rs6494229	1.05 (0.7-1.58) 0.8035	0.93 (0.68-1.28) 0.6567	1.04 (0.77-1.41) 0.804	1.15 (0.69-1.92) 0.592	0.88 (0.55-1.4) 0.5899	1.02 (0.74-1.42) 0.8963	1.05 (0.77-1.41) 0.7703	1 (0.65-1.55) 0.9964	1.07 (0.78-1.47) 0.6612	1 (0.59-1.68) 0.9905	0.69 (0.37-1.29) 0.2457	1.38 (1.01-1.88) **0.0416**
rs8042149	1.21 (0.83-1.76) 0.3333	0.99 (0.72-1.37) 0.9647	1.19 (0.88-1.62) 0.2629	1.23 (0.74-2.03) 0.4254	1.03 (0.66-1.6) 0.9025	1.13 (0.81-1.58) 0.4724	1.24 (0.91-1.7) 0.1803	1.2 (0.86-1.68) 0.2846	1.22 (0.89-1.68) 0.2213	1.03 (0.61-1.74) 0.9028	1.02 (0.55-1.88) 0.9598	1.35 (0.99-1.84) 0.0541
rs4775301	1.18 (0.81-1.71) 0.3839	0.91 (0.66-1.25) 0.5517	1.15 (0.85-1.55) 0.375	1.04 (0.64-1.7) 0.8754	0.91 (0.59-1.42) 0.6848	1.06 (0.76-1.48) 0.7175	1.16 (0.85-1.59) 0.3388	1.1 (0.79-1.54) 0.5628	1.22 (0.88-1.67) 0.2288	0.87 (0.51-1.47) 0.5993	0.74 (0.4-1.39) 0.3497	1.33 (0.98-1.8) 0.0676
rs11071561	1.05 (0.71-1.54) 0.8209	0.97 (0.7-1.35) 0.8557	1.03 (0.75-1.42) 0.8659	1.12 (0.67-1.87) 0.6765	0.92 (0.58-1.47) 0.7221	0.93 (0.66-1.3) 0.6632	1.02 (0.74-1.41) 0.8899	1.06 (0.75-1.51) 0.7276	1.11 (0.8-1.55) 0.525	0.89 (0.52-1.52) 0.6613	0.81 (0.42-1.54) 0.5153	1.31 (0.95-1.81) 0.0957

	NPSR1											
RORA	rs323922	rs324384	rs324396	rs324957	rs740347	rs1419779	rs324981	rs325462	rs17789420	rs34705969	rs727162	rs6972158
rs17191582	0.86 (0.52-1.4) 0.5398	1.05 (0.64-1.71) 0.848	1.3 (0.79-2.14) 0.2953	1.09 (0.66-1.79) 0.7401	1.28 (0.71-2.31) 0.4096	1.17 (0.71-1.94) 0.542	1.03 (0.63-1.69) 0.8912	1.04 (0.64-1.71) 0.8648	1.49 (0.76-2.92) 0.2439	1.16 (0.19-7.13) 0.8703	1.27 (0.7-2.28) 0.429	1.18 (0.75-1.85) 0.4692
rs6494221	0.93 (0.61-1.4) 0.7168	0.82 (0.53-1.26) 0.3584	0.99 (0.63-1.56) 0.9602	0.9 (0.58-1.39) 0.6282	1.07 (0.66-1.74) 0.7827	1.26 (0.83-1.92) 0.2811	1.18 (0.78-1.78) 0.4374	0.84 (0.55-1.29) 0.4331	1.39 (0.8-2.43) 0.2438	0.69 (0.12-3.99) 0.6743	1.05 (0.63-1.75) 0.8454	1.33 (0.9-1.99) 0.1567
rs8043356	1.07 (0.66-1.74) 0.7851	1.08 (0.67-1.74) 0.7649	0.66 (0.39-1.13) 0.1306	1.2 (0.74-1.94) 0.4559	1.04 (0.56-1.92) 0.9083	0.78 (0.47-1.28) 0.3276	0.77 (0.49-1.22) 0.2672	1.27 (0.8-2.02) 0.3081	0.89 (0.43-1.86) 0.7588	0.28 (0.05-1.6) 0.1532	0.79 (0.45-1.38) 0.4037	0.97 (0.61-1.52) 0.8839
rs12899193	0.94 (0.65-1.34) 0.7225	1.02 (0.71-1.45) 0.9298	0.95 (0.65-1.39) 0.7871	1.07 (0.75-1.54) 0.6968	1.2 (0.78-1.84) 0.4111	1 (0.7-1.43) 0.9952	0.87 (0.62-1.23) 0.437	1.08 (0.76-1.53) 0.6627	1.19 (0.72-1.96) 0.4914	0.53 (0.13-2.11) 0.3688	0.97 (0.64-1.47) 0.8833	1.17 (0.83-1.65) 0.3644
rs12909890	1.09 (0.77-1.54) 0.6343	0.83 (0.58-1.19) 0.3141	0.9 (0.61-1.32) 0.5889	0.83 (0.58-1.19) 0.3013	1.02 (0.66-1.57) 0.9318	1.09 (0.76-1.55) 0.6377	1.21 (0.86-1.71) 0.2698	0.82 (0.58-1.18) 0.2842	1.09 (0.65-1.81) 0.751	1.96 (0.5-7.65) 0.3315	1.26 (0.83-1.91) 0.2857	1.18 (0.83-1.67) 0.347
rs8024629	1.24 (0.79-1.95) 0.3542	0.74 (0.46-1.19) 0.209	0.95 (0.58-1.55) 0.8309	0.71 (0.44-1.16) 0.1724	1.36 (0.84-2.21) 0.2072	1.33 (0.86-2.07) 0.2016	1.34 (0.86-2.09) 0.2007	0.76 (0.48-1.21) 0.2423	1.63 (0.9-2.95) 0.1081	0.84 (0.14-4.93) 0.849	0.83 (0.46-1.52) 0.5487	1.28 (0.83-1.97) 0.2618
rs11635314	1.37 (0.85-2.2) 0.194	1.04 (0.64-1.68) 0.8762	1.3 (0.76-2.23) 0.3448	1.12 (0.69-1.83) 0.6443	0.86 (0.45-1.64) 0.6502	0.67 (0.42-1.09) 0.1092	0.79 (0.5-1.26) 0.3239	1.2 (0.75-1.93) 0.4482	0.72 (0.35-1.48) 0.3711	1.93 (0.27-13.92) 0.513	0.68 (0.37-1.24) 0.2051	0.96 (0.6-1.52) 0.8499
rs4775289	0.99 (0.72-1.35) 0.9303	0.91 (0.66-1.26) 0.5774	0.88 (0.61-1.27) 0.4983	0.87 (0.63-1.2) 0.3947	1.4 (0.93-2.11) 0.1054	1.36 (0.98-1.9) 0.0667	0.99 (0.73-1.36) 0.9678	0.98 (0.72-1.34) 0.9004	1.53 (0.94-2.51) 0.0888	1.31 (0.51-3.37) 0.5698	1.33 (0.92-1.91) 0.1293	1.03 (0.74-1.43) 0.8647
rs17237367	1.17 (0.82-1.67) 0.3824	0.7 (0.48-1.04) 0.0744	0.81 (0.54-1.23) 0.3229	0.74 (0.51-1.09) 0.1331	0.96 (0.61-1.52) 0.871	1.26 (0.85-1.86) 0.2522	1.52 (1.05-2.21) **0.0268**	0.68 (0.47-0.99) **0.0431**	1.24 (0.73-2.11) 0.4193	0.51 (0.13-2) 0.3343	0.91 (0.59-1.4) 0.6725	1.15 (0.81-1.64) 0.4302
rs17191596	1.02 (0.58-1.79) 0.9533	0.88 (0.5-1.55) 0.6556	1.06 (0.6-1.89) 0.8319	0.83 (0.47-1.48) 0.5298	1.38 (0.75-2.55) 0.3066	1.29 (0.76-2.19) 0.3506	1.14 (0.66-1.95) 0.6454	0.85 (0.49-1.49) 0.5727	1.63 (0.78-3.38) 0.1921	1.27 (0.21-7.8) 0.7993	0.54 (0.25-1.18) 0.1241	1.47 (0.88-2.45) 0.1378
rs4775292	0.9 (0.66-1.22) 0.4861	0.98 (0.7-1.35) 0.888	0.92 (0.63-1.33) 0.6448	0.94 (0.68-1.32) 0.7362	1.11 (0.73-1.69) 0.6202	1.23 (0.87-1.72) 0.238	0.97 (0.71-1.33) 0.8654	1.05 (0.77-1.44) 0.7526	1.25 (0.78-1.99) 0.3522	1.53 (0.48-4.93) 0.4746	1.41 (0.96-2.06) 0.0768	1.09 (0.79-1.52) 0.5892
rs17204367	1.07 (0.79-1.45) 0.66	0.92 (0.67-1.26) 0.5997	1.11 (0.79-1.57) 0.5479	0.96 (0.7-1.32) 0.8193	0.95 (0.63-1.42) 0.807	1.07 (0.76-1.5) 0.7027	1.1 (0.81-1.48) 0.5522	0.93 (0.68-1.26) 0.6376	1.05 (0.66-1.68) 0.8217	0.5 (0.14-1.82) 0.2917	0.66 (0.44-0.97) **0.0344**	1.18 (0.87-1.62) 0.2926
rs17204395	0.94 (0.62-1.42) 0.7577	0.97 (0.63-1.47) 0.8711	1.3 (0.85-1.98) 0.2232	0.95 (0.62-1.46) 0.8195	1.13 (0.7-1.81) 0.6167	1.32 (0.89-1.97) 0.1667	1.17 (0.79-1.75) 0.4352	0.92 (0.61-1.39) 0.7015	1.18 (0.69-2.03) 0.5478	0.63 (0.11-3.67) 0.6073	0.48 (0.27-0.86) **0.0138**	1.27 (0.87-1.87) 0.2156
rs12437690	1.36 (0.98-1.87) 0.0649	0.84 (0.61-1.16) 0.2901	1.11 (0.79-1.56) 0.5335	0.88 (0.64-1.22) 0.4418	0.98 (0.66-1.47) 0.9375	0.99 (0.71-1.36) 0.9275	1.1 (0.81-1.5) 0.5484	0.87 (0.64-1.2) 0.4019	1.08 (0.69-1.7) 0.7314	1.43 (0.44-4.7) 0.5558	0.76 (0.52-1.12) 0.1719	1.17 (0.86-1.6) 0.3189
rs9302215	1.26 (0.91-1.75) 0.17	0.88 (0.63-1.23) 0.4699	1.11 (0.77-1.59) 0.5784	0.95 (0.68-1.32) 0.7473	1.19 (0.78-1.81) 0.4133	0.99 (0.71-1.38) 0.9414	1.02 (0.75-1.4) 0.8926	0.97 (0.7-1.34) 0.8573	1.03 (0.64-1.64) 0.9115	1.06 (0.29-3.88) 0.9323	0.59 (0.39-0.9) **0.0135**	1.17 (0.84-1.62) 0.3571
rs17204440	1.13 (0.83-1.54) 0.4365	0.98 (0.71-1.35) 0.9118	1.04 (0.74-1.47) 0.8275	1.03 (0.75-1.43) 0.8395	0.83 (0.55-1.25) 0.3641	0.86 (0.62-1.2) 0.3834	1.02 (0.75-1.39) 0.9058	0.96 (0.7-1.32) 0.8213	0.9 (0.56-1.44) 0.6562	0.76 (0.24-2.39) 0.6451	0.59 (0.41-0.87) **0.0073**	1.17 (0.86-1.6) 0.3205
rs7164773	0.71 (0.52-0.98) **0.0374**	1.32 (0.97-1.82) 0.0797	0.94 (0.67-1.34) 0.7476	1.22 (0.89-1.68) 0.2146	0.93 (0.63-1.38) 0.7177	0.98 (0.71-1.34) 0.8856	0.87 (0.64-1.18) 0.3676	1.18 (0.87-1.61) 0.2909	0.95 (0.61-1.48) 0.8181	0.84 (0.26-2.75) 0.7697	1.06 (0.72-1.55) 0.7773	0.88 (0.64-1.21) 0.4231
rs10519067	0.93 (0.57-1.52) 0.7762	1.09 (0.67-1.76) 0.7253	0.8 (0.47-1.37) 0.4198	1.06 (0.66-1.73) 0.7987	0.68 (0.33-1.38) 0.2824	0.81 (0.49-1.33) 0.3965	1.11 (0.7-1.77) 0.6606	0.89 (0.55-1.43) 0.6201	0.82 (0.39-1.7) 0.5872	0.65 (0.15-2.77) 0.5593	0.79 (0.44-1.41) 0.4227	0.93 (0.57-1.52) 0.7867
rs12438866	1.1 (0.8-1.53) 0.5595	0.94 (0.67-1.32) 0.7338	1.02 (0.71-1.46) 0.9226	0.9 (0.64-1.27) 0.5592	0.88 (0.58-1.34) 0.5449	1.08 (0.77-1.51) 0.6665	1.19 (0.86-1.64) 0.2918	0.82 (0.59-1.14) 0.2458	1.03 (0.64-1.68) 0.8924	0.76 (0.24-2.39) 0.6448	0.7 (0.47-1.05) 0.085	1.11 (0.81-1.53) 0.5118
rs17204454	0.81 (0.6-1.1) 0.1766	1.13 (0.83-1.54) 0.4382	0.95 (0.67-1.35) 0.7799	1.07 (0.78-1.47) 0.6679	0.98 (0.66-1.46) 0.9204	1.11 (0.8-1.53) 0.534	0.93 (0.69-1.26) 0.6324	1.16 (0.85-1.58) 0.338	1.03 (0.65-1.62) 0.9021	0.98 (0.36-2.69) 0.9744	1.4 (0.98-2) 0.0673	0.86 (0.63-1.17) 0.3342
rs922782	0.75 (0.54-1.04) 0.0869	1.12 (0.81-1.56) 0.4922	1.17 (0.83-1.65) 0.378	1.03 (0.74-1.43) 0.8596	1.29 (0.85-1.97) 0.2365	1.26 (0.9-1.75) 0.174	0.89 (0.65-1.23) 0.4931	1.11 (0.81-1.53) 0.5167	1.24 (0.78-1.97) 0.373	1.11 (0.4-3.11) 0.8382	0.7 (0.48-1.01) 0.054	1.19 (0.88-1.6) 0.2623
rs7173227	1.84 (1.15-2.93) **0.0105**	0.72 (0.45-1.16) 0.1751	0.83 (0.48-1.42) 0.4913	0.78 (0.48-1.26) 0.3107	1.12 (0.61-2.06) 0.7126	0.93 (0.59-1.49) 0.7752	1.06 (0.68-1.66) 0.7941	0.8 (0.51-1.26) 0.3341	1.04 (0.53-2.04) 0.9023	1.19 (0.23-6.09) 0.8346	1.23 (0.72-2.1) 0.4423	1.04 (0.66-1.65) 0.8636
rs2899662	1.08 (0.78-1.48) 0.6448	0.84 (0.6-1.16) 0.2893	0.66 (0.45-0.96) **0.0288**	0.78 (0.56-1.1) 0.1566	1.54 (1.02-2.34) **0.0397**	1.3 (0.92-1.84) 0.1324	1.01 (0.74-1.39) 0.9417	0.94 (0.68-1.3) 0.7148	1.32 (0.8-2.18) 0.2815	1.19 (0.44-3.24) 0.7377	1.49 (1.03-2.14) **0.034**	0.81 (0.58-1.13) 0.2107
rs341459	0.86 (0.61-1.21) 0.3877	1.1 (0.78-1.56) 0.5752	1.31 (0.92-1.87) 0.1321	1.1 (0.78-1.57) 0.5882	1.04 (0.69-1.59) 0.8378	1.13 (0.8-1.61) 0.4812	0.99 (0.71-1.38) 0.9419	1.13 (0.81-1.58) 0.4783	1.06 (0.67-1.69) 0.7997	0.73 (0.17-3.03) 0.6599	0.55 (0.35-0.86) **0.0083**	1.23 (0.9-1.7) 0.1975
rs10162630	0.77 (0.56-1.06) 0.1039	1.24 (0.9-1.7) 0.1952	1.42 (0.99-2.04) 0.0562	1.21 (0.88-1.66) 0.2523	0.85 (0.57-1.28) 0.4385	0.96 (0.7-1.33) 0.8264	1.06 (0.78-1.43) 0.7056	1.05 (0.77-1.43) 0.7616	0.91 (0.57-1.46) 0.6935	0.8 (0.29-2.19) 0.6668	0.63 (0.43-0.9) **0.0128**	1.32 (0.96-1.82) 0.0919
rs12591848	1.42 (0.83-2.42) 0.1956	0.99 (0.59-1.67) 0.9778	1.2 (0.66-2.19) 0.548	1.27 (0.76-2.12) 0.3654	0.73 (0.35-1.51) 0.3922	0.54 (0.32-0.93) **0.026**	0.75 (0.46-1.25) 0.2736	1.18 (0.71-1.96) 0.5352	0.77 (0.35-1.73) 0.5307	1.03 (0.16-6.49) 0.9707	1.08 (0.59-1.98) 0.8013	0.88 (0.53-1.48) 0.6333
rs7171681	1.04 (0.74-1.45) 0.8312	0.86 (0.61-1.22) 0.4016	0.72 (0.48-1.07) 0.1011	0.87 (0.62-1.23) 0.4415	1.19 (0.77-1.83) 0.4395	1.19 (0.84-1.67) 0.3291	0.97 (0.7-1.34) 0.8451	0.94 (0.68-1.31) 0.719	1.29 (0.78-2.15) 0.3227	1.39 (0.47-4.08) 0.5476	1.36 (0.93-1.99) 0.1121	0.91 (0.64-1.29) 0.5882
rs7169281	0.85 (0.62-1.15) 0.2872	1.23 (0.89-1.7) 0.2004	1.36 (0.97-1.92) 0.0785	1.17 (0.84-1.61) 0.35	0.99 (0.67-1.45) 0.9542	1.06 (0.77-1.48) 0.7075	0.98 (0.72-1.34) 0.9207	1.13 (0.83-1.55) 0.4327	1.03 (0.66-1.61) 0.883	0.79 (0.28-2.26) 0.6665	0.7 (0.49-1.01) 0.0591	1.03 (0.76-1.4) 0.8553
rs10152719	0.91 (0.6-1.39) 0.6733	1.19 (0.78-1.83) 0.4198	1.05 (0.65-1.7) 0.8264	1.19 (0.77-1.82) 0.4374	0.56 (0.3-1.04) 0.0669	0.62 (0.4-0.98) **0.0394**	0.85 (0.56-1.3) 0.453	1.1 (0.72-1.68) 0.6449	0.5 (0.24-1.04) 0.0634	0.56 (0.12-2.67) 0.4686	0.96 (0.61-1.52) 0.8632	1.11 (0.74-1.66) 0.6227
rs341382	1.14 (0.8-1.62) 0.4682	0.77 (0.53-1.1) 0.1531	0.75 (0.5-1.13) 0.1711	0.79 (0.55-1.14) 0.2079	1.37 (0.88-2.13) 0.1632	1.18 (0.82-1.7) 0.3722	1.05 (0.74-1.48) 0.801	0.89 (0.62-1.26) 0.506	1.34 (0.79-2.25) 0.2731	1.52 (0.52-4.43) 0.438	1.34 (0.91-1.95) 0.1364	1 (0.69-1.44) 0.9932
rs341392	0.91 (0.62-1.31) 0.5979	1.17 (0.79-1.72) 0.4413	0.87 (0.57-1.32) 0.5165	1.13 (0.77-1.67) 0.5308	0.66 (0.39-1.11) 0.1202	0.84 (0.57-1.24) 0.3821	0.89 (0.61-1.29) 0.5294	1.03 (0.71-1.5) 0.8821	0.65 (0.36-1.19) 0.165	0.41 (0.09-1.92) 0.257	1.01 (0.68-1.5) 0.9608	0.9 (0.62-1.29) 0.5653
rs6494229	1.18 (0.86-1.62) 0.309	0.84 (0.61-1.16) 0.2836	0.74 (0.52-1.05) 0.0938	0.84 (0.61-1.17) 0.3076	1.03 (0.69-1.55) 0.8835	0.88 (0.63-1.23) 0.4612	1 (0.74-1.37) 0.975	0.88 (0.64-1.2) 0.4162	0.97 (0.6-1.57) 0.8871	1.25 (0.41-3.76) 0.696	1.54 (1.06-2.23) **0.0229**	1.03 (0.75-1.41) 0.8583
rs8042149	1.34 (0.97-1.84) 0.073	0.76 (0.55-1.05) 0.0945	0.59 (0.41-0.83) **0.0028**	0.79 (0.57-1.09) 0.1491	1.2 (0.81-1.77) 0.3685	1.1 (0.79-1.52) 0.5846	1.08 (0.8-1.47) 0.6122	0.82 (0.61-1.12) 0.2202	1.21 (0.76-1.92) 0.4341	1.12 (0.38-3.35) 0.8366	1.38 (0.95-1.99) 0.0895	1.06 (0.77-1.45) 0.7181
rs4775301	1.23 (0.9-1.67) 0.1964	0.75 (0.54-1.03) 0.0773	0.61 (0.43-0.87) **0.0058**	0.78 (0.57-1.08) 0.1312	1.24 (0.84-1.83) 0.2746	1.15 (0.83-1.59) 0.4137	1.11 (0.81-1.51) 0.5145	0.81 (0.6-1.11) 0.1908	1.26 (0.79-2.01) 0.338	1.2 (0.38-3.85) 0.7555	1.49 (1.04-2.14) **0.0298**	1.08 (0.78-1.48) 0.6479
rs11071561	1.16 (0.84-1.59) 0.3784	0.76 (0.55-1.06) 0.1076	0.64 (0.45-0.93) **0.0191**	0.78 (0.56-1.08) 0.1384	1.08 (0.71-1.63) 0.728	1.06 (0.76-1.49) 0.7157	1.13 (0.83-1.54) 0.449	0.79 (0.58-1.09) 0.1535	1.12 (0.68-1.83) 0.6579	1.29 (0.41-4.02) 0.6597	1.56 (1.07-2.28) **0.0198**	1.09 (0.78-1.51) 0.6071

Supplementary Table S9. Complete replication results of RORA*NPSR1 interactions on asthma without nocturnal symptoms in BAMSE and MAAS.

effect direction different to MAGICS/ISAAC
effect direction the same as in MAGICS/ISAAC
borderline significant replication
significant replication of interaction on asthma without nocturnal symptoms

NPSR1	*RORA*	asthma w/o nocturnal symptoms (MAGICS)	asthma w/o nocturnal symptoms (BAMSE)	asthma w/o nocturnal symptoms (MAAS)
rs323917	rs4775292	0.45 (0.22-0.93) **0.0318**	0.71 (0.28-1.82) 0.4774	0.84 (0.28-2.55) 0.7638
	rs17204395	2.74 (1.11-6.75) **0.0285**	na	1.23 (0.35-4.27) 0.7485
	rs9302215	2.05 (1.04-4.03) **0.037**	0.64 (0.25-1.65) 0.3562	1.03 (0.35-3.07) 0.9555
	rs17204440	2.22 (1.11-4.43) **0.0234**	na	1.51 (0.52-4.42) 0.4493
	rs7164773	0.48 (0.24-0.93) **0.0304**	0.79 (0.31-1.98) 0.6152	1.08 (0.37-3.22) 0.8841
	rs12438866	2.52 (1.23-5.16) **0.0117**	2.37 (1-5.61) 0.0491	1.42 (0.51-4) 0.5036
	rs17204454	0.29 (0.13-0.61) **0.0012**	0.66 (0.27-1.63) 0.3654	0.6 (0.2-1.82) 0.3702
	rs2899662	0.27 (0.12-0.61) **0.0016**	1.01 (0.43-2.35) 0.9871	0.84 (0.28-2.53) 0.751
	rs10162630	2.43 (1.16-5.08) **0.0187**	1.57 (0.68-3.61) 0.2899	1.32 (0.48-3.67) 0.592
rs1345267	rs7173227	1.71 (1.06-2.77) **0.0292**	na	1.49 (0.81-2.75) 0.197
	rs10162630	0.65 (0.47-0.9) **0.0087**	na	0.77 (0.49-1.23) 0.2743
	rs6494229	1.38 (1.01-1.88) **0.0416**	na	1.08 (0.68-1.72) 0.749
rs324396	rs2899662	0.66 (0.45-0.96) **0.0288**	0.93 (0.62-1.38) 0.7193	0.69 (0.41-1.15) 0.1581
	rs8042149	0.59 (0.41-0.83) **0.0028**	0.9 (0.6-1.33) 0.586	0.88 (0.54-1.43) 0.6104
	rs4775301	0.61 (0.43-0.87) **0.0058**	0.93 (0.62-1.39) 0.7257	0.76 (0.47-1.24) 0.277
	rs11071561	0.64 (0.45-0.93) **0.0191**	1.24 (0.83-1.86) 0.2893	0.74 (0.44-1.22) 0.2379
rs740347	rs2899662	1.54 (1.02-2.34) **0.0397**	1.09 (0.66-1.79) 0.7492	1.01 (0.53-1.93) 0.9664
rs727162	rs17204367	0.66 (0.44-0.97) **0.0344**	1.08 (0.67-1.73) 0.7662	0.92 (0.53-1.6) 0.7766
	rs17204395	0.48 (0.27-0.86) **0.0138**	na	0.92 (0.46-1.83) 0.814
	rs9302215	0.59 (0.39-0.9) **0.0135**	1.02 (0.65-1.6) 0.9486	1.08 (0.64-1.84) 0.7676
	rs17204440	0.59 (0.41-0.87) **0.0073**	na	0.86 (0.51-1.46) 0.5808
	rs2899662	1.49 (1.03-2.14) **0.034**	0.9 (0.56-1.43) 0.643	0.9 (0.52-1.54) 0.6923
	rs341459	0.55 (0.35-0.86) **0.0083**	1.05 (0.67-1.63) 0.8467	1.1 (0.62-1.95) 0.7516
	rs10162630	0.63 (0.43-0.9) **0.0128**	1.01 (0.65-1.58) 0.9579	1.25 (0.73-2.14) 0.4074
	rs6494229	1.54 (1.06-2.23) **0.0229**	1.04 (0.65-1.66) 0.8829	1.23 (0.71-2.15) 0.4599
	rs4775301	1.49 (1.04-2.14) **0.0298**	0.96 (0.6-1.54) 0.8702	1.54 (0.88-2.72) 0.1331
	rs11071561	1.56 (1.07-2.28) **0.0198**	0.95 (0.6-1.49) 0.8132	1.5 (0.85-2.66) 0.1637

Supplementary Table S10. Interactions between RORA and NPSR1 on severe asthma in MAGICS/ISAAC

	NPSR1											
RORA	rs2609234	rs1006392	rs714588	rs1963499	rs2168890	rs2530547	rs887020	rs1379928	rs963218	rs2609215	rs323917	rs1345267
rs17191582	0.09 (0.26) 0.7324	0.25 (0.2) 0.1959	0.22 (0.2) 0.2634	0.96 (0.51) 0.0607	0.3 (0.3) 0.3129	0.29 (0.21) 0.1722	**0.45 (0.2)** **0.026**	0.28 (0.24) 0.2453	0.33 (0.2) 0.0924	**1.09 (0.39)** **0.0058**	**1.31 (0.54)** **0.0144**	-0.22 (-0.18) 0.2367
rs6494221	-0.02 (-0.22) 0.9421	0.16 (0.16) 0.3287	0.09 (0.17) 0.591	0.35 (0.42) 0.4015	-0.02 (-0.25) 0.9243	0.13 (0.18) 0.4708	0.29 (0.17) 0.0885	0.14 (0.19) 0.4548	0.2 (0.16) 0.2368	0.3 (0.29) 0.3005	0.66 (0.43) 0.1244	-0.11 (-0.16) 0.5043
rs8043356	0.27 (0.34) 0.4311	-0.4 (-0.27) 0.1354	0.32 (0.26) 0.219	0.13 (0.56) 0.8142	-0.11 (-0.32) 0.7375	0.17 (0.29) 0.5481	0.06 (0.26) 0.8007	-0.06 (-0.32) 0.8457	0.27 (0.26) 0.2969	-0.36 (-0.57) 0.5329	-0.72 (-0.85) 0.4009	0.23 (0.27) 0.3873
rs12899193	0.18 (0.2) 0.3588	0 (-0.14) 0.9855	0.2 (0.15) 0.1692	0.43 (0.35) 0.2154	-0.03 (-0.22) 0.8887	0.08 (0.16) 0.5993	0.25 (0.15) 0.1026	0.23 (0.17) 0.1884	0.24 (0.15) 0.1048	0.26 (0.26) 0.3143	0.51 (0.37) 0.1652	0.06 (0.15) 0.6734
rs12909890	-0.02 (-0.19) 0.9134	0.22 (0.14) 0.1149	-0.13 (-0.14) 0.3763	0.31 (0.31) 0.3196	0.04 (0.21) 0.8363	-0.07 (-0.15) 0.622	0.15 (0.15) 0.325	-0.09 (-0.18) 0.6078	-0.07 (-0.15) 0.6478	0.04 (0.26) 0.8838	0.31 (0.37) 0.4004	-0.08 (-0.14) 0.5587
rs8024629	0.32 (0.23) 0.1655	0.13 (0.17) 0.4634	0.29 (0.17) 0.095	0.79 (0.44) 0.072	0.31 (0.27) 0.2539	**0.44 (0.19)** **0.0208**	**0.55 (0.18)** **0.0017**	0.3 (0.22) 0.1701	0.29 (0.17) 0.0842	**0.83 (0.35)** **0.0184**	0.84 (0.47) 0.0745	-0.18 (-0.16) 0.2574
rs11635314	**-0.83 (-0.27)** **0.0018**	0.12 (0.21) 0.5465	-0.31 (-0.2) 0.13	-0.29 (-0.44) 0.511	-0.56 (-0.31) 0.0722	-0.29 (-0.22) 0.1904	-0.37 (-0.21) 0.0808	-0.38 (-0.23) 0.1019	-0.07 (-0.2) 0.7146	-0.4 (-0.37) 0.2846	-0.39 (-0.56) 0.4821	-0.26 (-0.2) 0.1966
rs4775289	**0.45 (0.18)** **0.012**	0.1 (0.14) 0.48	**0.4 (0.14)** **0.0037**	**0.82 (0.29)** **0.0047**	**0.63 (0.21)** **0.002**	**0.53 (0.14)** **0.0002**	0.56 (0.14) 0	**0.39 (0.16)** **0.0166**	**0.34 (0.13)** **0.0122**	**0.59 (0.24)** **0.0135**	0.44 (0.29) 0.1256	0.03 (0.13) 0.7886
rs17237367	-0.12 (-0.22) 0.579	0.12 (0.16) 0.4784	-0.3 (-0.16) 0.0622	-0.29 (-0.33) 0.3749	-0.42 (-0.26) 0.1081	-0.29 (-0.17) 0.0805	-0.25 (-0.16) 0.1253	-0.14 (-0.19) 0.4623	**-0.35 (-0.17)** **0.0334**	-0.42 (-0.32) 0.1832	-0.23 (-0.39) 0.55	-0.16 (-0.16) 0.302
rs17191596	0.08 (0.29) 0.7888	0.24 (0.22) 0.2714	0.22 (0.22) 0.3266	**1.86 (0.59)** **0.0016**	0.5 (0.31) 0.1089	0.43 (0.24) 0.0726	**0.51 (0.22)** **0.0228**	0.13 (0.27) 0.6263	0.31 (0.22) 0.1484	**0.94 (0.41)** **0.0209**	**1.43 (0.58)** **0.0135**	-0.12 (-0.2) 0.5455
rs4775292	**0.43 (0.18)** **0.0153**	0.08 (0.14) 0.5522	**0.29 (0.14)** **0.0391**	0.38 (0.31) 0.2305	0.28 (0.2) 0.1712	0.26 (0.14) 0.0736	**0.36 (0.14)** **0.0095**	**0.34 (0.16)** **0.0303**	0.13 (0.13) 0.3241	0.22 (0.24) 0.3541	0.15 (0.31) 0.6247	-0.05 (-0.13) 0.6883
rs17204367	-0.33 (-0.18) 0.0693	-0.13 (-0.14) 0.3623	0.06 (0.14) 0.6562	-0.07 (-0.31) 0.8311	0.14 (0.2) 0.4784	0.11 (0.15) 0.4506	-0.01 (-0.15) 0.9602	-0.11 (-0.16) 0.494	0.18 (0.14) 0.189	0.26 (0.25) 0.308	0.5 (0.31) 0.1072	-0.12 (-0.13) 0.3572
rs17204395	-0.04 (-0.21) 0.8367	0.02 (0.18) 0.91	0.14 (0.17) 0.4103	0.54 (0.38) 0.1559	**0.48 (0.24)** **0.0486**	0.2 (0.18) 0.2634	0.19 (0.17) 0.2555	0.16 (0.2) 0.4322	0.16 (0.17) 0.3262	**0.78 (0.31)** **0.0123**	0.6 (0.4) 0.1349	-0.01 (-0.17) 0.9418
rs12437690	**-0.51 (-0.18)** **0.0039**	0.1 (0.14) 0.4792	-0.23 (-0.13) 0.0857	-0.09 (-0.29) 0.7424	-0.1 (-0.2) 0.6236	-0.1 (-0.14) 0.4746	-0.15 (-0.14) 0.2851	-0.26 (-0.15) 0.0862	-0.04 (-0.13) 0.7583	-0.08 (-0.23) 0.7231	-0.1 (-0.31) 0.7365	-0.03 (-0.13) 0.8052
rs9302215	-0.32 (-0.18) 0.0727	0.07 (0.14) 0.6108	-0.07 (-0.14) 0.5844	0.21 (0.32) 0.5012	0.17 (0.2) 0.4056	0.03 (0.14) 0.8263	-0.06 (-0.14) 0.6568	-0.04 (-0.15) 0.7972	0.13 (0.14) 0.3284	0.31 (0.23) 0.1814	0.34 (0.3) 0.2551	-0.07 (-0.13) 0.5728
rs17204440	-0.15 (-0.17) 0.3786	0.04 (0.13) 0.7774	-0.09 (-0.13) 0.4756	-0.06 (-0.24) 0.8083	-0.05 (-0.19) 0.8063	-0.03 (-0.14) 0.855	-0.12 (-0.13) 0.3733	-0.02 (-0.15) 0.8715	0.07 (0.13) 0.6162	0.22 (0.22) 0.3232	0.24 (0.27) 0.3752	-0.06 (-0.12) 0.6445
rs7164773	-0.06 (-0.17) 0.733	0.14 (0.13) 0.2805	-0.09 (-0.13) 0.492	0.01 (0.29) 0.9764	-0.01 (-0.2) 0.9673	-0.04 (-0.14) 0.7678	0.04 (0.13) 0.7836	0.07 (0.15) 0.6274	0.08 (0.13) 0.5475	0.11 (0.24) 0.6529	0.17 (0.3) 0.5758	-0.1 (-0.12) 0.4058
rs10519067	0.22 (0.27) 0.4296	-0.1 (-0.21) 0.6155	-0.1 (-0.2) 0.6238	0.11 (0.44) 0.8077	-0.34 (-0.29) 0.2415	-0.12 (-0.23) 0.6122	-0.09 (-0.21) 0.6771	-0.05 (-0.25) 0.8318	-0.14 (-0.2) 0.5024	-0.11 (-0.38) 0.7736	-0.49 (-0.47) 0.2945	0.1 (0.2) 0.6102
rs12438866	-0.12 (-0.17) 0.4727	-0.03 (-0.14) 0.8289	-0.18 (-0.13) 0.1896	-0.19 (-0.25) 0.4305	-0.23 (-0.19) 0.2288	-0.26 (-0.15) 0.0731	-0.19 (-0.13) 0.1396	-0.14 (-0.16) 0.3683	-0.13 (-0.13) 0.3139	-0.15 (-0.24) 0.538	-0.24 (-0.28) 0.3973	0.06 (0.13) 0.6359
rs17204454	0.22 (0.17) 0.1918	-0.07 (-0.13) 0.5965	**0.26 (0.13)** **0.0497**	0.12 (0.29) 0.6896	0.28 (0.19) 0.1377	0.14 (0.14) 0.2869	0.15 (0.13) 0.2613	0.11 (0.15) 0.4791	0.05 (0.13) 0.6724	0.11 (0.23) 0.6398	0.3 (0.29) 0.302	-0.02 (-0.13) 0.8765
rs922782	-0.01 (-0.17) 0.9372	0.07 (0.13) 0.6212	0.14 (0.13) 0.2835	0.51 (0.31) 0.104	0.3 (0.2) 0.1331	0.12 (0.14) 0.3856	0.13 (0.14) 0.3478	0.16 (0.16) 0.3212	0.08 (0.13) 0.5512	0.32 (0.25) 0.2031	0.19 (0.34) 0.5755	-0.04 (-0.13) 0.7578
rs7173227	-0.23 (-0.26) 0.3803	-0.06 (-0.2) 0.7795	-0.29 (-0.19) 0.1212	-0.5 (-0.33) 0.13	-0.34 (-0.27) 0.2069	-0.03 (-0.2) 0.8917	-0.13 (-0.19) 0.4737	-0.13 (-0.24) 0.5962	-0.03 (-0.2) 0.87	-0.41 (-0.35) 0.2435	-0.37 (-0.45) 0.4116	0.04 (0.19) 0.8413
rs2899662	0.05 (0.18) 0.7579	0.05 (0.14) 0.7507	0.09 (0.14) 0.499	0.3 (0.31) 0.3325	0.17 (0.2) 0.3968	0.1 (0.14) 0.4646	0.05 (0.13) 0.7177	0.03 (0.16) 0.8713	-0.01 (-0.14) 0.9404	0.17 (0.25) 0.4843	0.24 (0.32) 0.4518	0.08 (0.13) 0.5571
rs341459	0.14 (0.18) 0.4477	-0.05 (-0.15) 0.7308	0.2 (0.14) 0.1546	0.06 (0.33) 0.8599	0.2 (0.21) 0.3288	0.04 (0.15) 0.7586	0.14 (0.14) 0.3291	0.13 (0.17) 0.4318	0.07 (0.14) 0.611	-0.03 (-0.26) 0.9167	0.13 (0.37) 0.7301	-0.09 (-0.14) 0.5051
rs10162630	0.04 (0.17) 0.8047	-0.05 (-0.14) 0.7288	0.08 (0.14) 0.5703	0.07 (0.29) 0.806	0.03 (0.19) 0.8587	-0.09 (-0.14) 0.5201	0 (-0.13) 0.9942	0.01 (0.16) 0.9542	-0.02 (-0.13) 0.9005	-0.02 (-0.24) 0.948	-0.13 (-0.33) 0.6946	-0.03 (-0.13) 0.8
rs12591848	-0.09 (-0.31) 0.7774	0.39 (0.23) 0.0944	-0.29 (-0.22) 0.1857	-0.3 (-0.47) 0.5215	-0.11 (-0.36) 0.7508	0.11 (0.25) 0.6497	-0.21 (-0.23) 0.3561	0.16 (0.27) 0.5663	0.22 (0.24) 0.3548	0.41 (0.42) 0.3271	0.61 (0.6) 0.3153	-0.2 (-0.21) 0.3526
rs7171681	0.22 (0.18) 0.2246	-0.07 (-0.15) 0.6474	0.24 (0.15) 0.114	0.29 (0.32) 0.3583	0.25 (0.21) 0.2497	0.23 (0.15) 0.1198	0.2 (0.14) 0.1577	0.2 (0.17) 0.2406	0.05 (0.14) 0.7067	0.09 (0.25) 0.7142	0.22 (0.32) 0.5016	0.1 (0.14) 0.4785
rs7169281	-0.08 (-0.17) 0.6443	0 (0.14) 0.999	0.04 (0.14) 0.763	0.34 (0.27) 0.1989	0.3 (0.2) 0.1287	0.12 (0.14) 0.3988	0.01 (0.13) 0.9413	0 (0.16) 0.9813	0.01 (0.13) 0.9432	0.3 (0.25) 0.2282	0.31 (0.32) 0.3431	-0.03 (-0.13) 0.8116
rs10152719	0.04 (0.25) 0.8774	-0.08 (-0.18) 0.6621	0.08 (0.18) 0.6466	**-0.69 (-0.3)** **0.0197**	-0.49 (-0.26) 0.0572	-0.23 (-0.2) 0.2529	0.02 (0.18) 0.9153	-0.04 (-0.24) 0.8608	0.06 (0.18) 0.7447	-0.44 (-0.33) 0.1761	-0.25 (-0.37) 0.5053	-0.01 (-0.17) 0.9423
rs341382	0.18 (0.18) 0.3147	-0.01 (-0.15) 0.9665	0.24 (0.15) 0.1174	0.26 (0.32) 0.4198	0.21 (0.22) 0.3342	0.26 (0.15) 0.0871	0.23 (0.15) 0.1214	0.21 (0.17) 0.2066	0.11 (0.14) 0.4495	0.1 (0.25) 0.7	0.19 (0.32) 0.5457	0.03 (0.14) 0.8353
rs341392	0.15 (0.24) 0.5282	0.01 (0.17) 0.9734	-0.15 (-0.18) 0.3975	-0.32 (-0.37) 0.3928	-0.3 (-0.24) 0.205	**-0.38 (-0.18)** **0.0382**	-0.14 (-0.17) 0.4098	-0.19 (-0.22) 0.3881	-0.13 (-0.17) 0.4582	-0.3 (-0.31) 0.3301	-0.17 (-0.4) 0.6643	0.04 (0.16) 0.7939
rs6494229	0.04 (0.17) 0.8051	-0.06 (-0.14) 0.6544	0.08 (0.14) 0.5394	-0.48 (-0.3) 0.1075	-0.27 (-0.2) 0.1703	-0.1 (-0.14) 0.4894	0.1 (0.13) 0.4442	0.07 (0.16) 0.6689	0.05 (0.14) 0.7283	**-0.66 (-0.25)** **0.0099**	-0.49 (-0.33) 0.1377	0.01 (0.13) 0.9527
rs8042149	0.15 (0.17) 0.374	0.02 (0.14) 0.8594	-0.04 (-0.14) 0.7473	-0.41 (-0.27) 0.1314	-0.3 (-0.21) 0.1469	-0.07 (-0.14) 0.64	0.07 (0.13) 0.6235	0.04 (0.16) 0.7898	-0.01 (-0.14) 0.942	-0.3 (-0.24) 0.208	-0.32 (-0.3) 0.2893	-0.08 (-0.13) 0.5373
rs4775301	0.16 (0.17) 0.3537	0.02 (0.14) 0.9144	0.05 (0.14) 0.7166	-0.19 (-0.28) 0.4944	-0.15 (-0.2) 0.4537	0.02 (0.15) 0.9098	0.18 (0.14) 0.1909	0.09 (0.16) 0.5854	0.06 (0.14) 0.6741	-0.34 (-0.24) 0.1646	-0.11 (-0.3) 0.7219	-0.04 (-0.13) 0.7488
rs11071561	0.24 (0.17) 0.1543	0.05 (0.14) 0.744	0.08 (0.14) 0.5952	0.06 (0.23) 0.7971	0.02 (0.21) 0.9117	0.01 (0.15) 0.9267	0.19 (0.14) 0.1827	0.18 (0.16) 0.278	0.03 (0.14) 0.814	-0.14 (-0.24) 0.5604	-0.09 (-0.27) 0.7484	-0.08 (-0.14) 0.5622

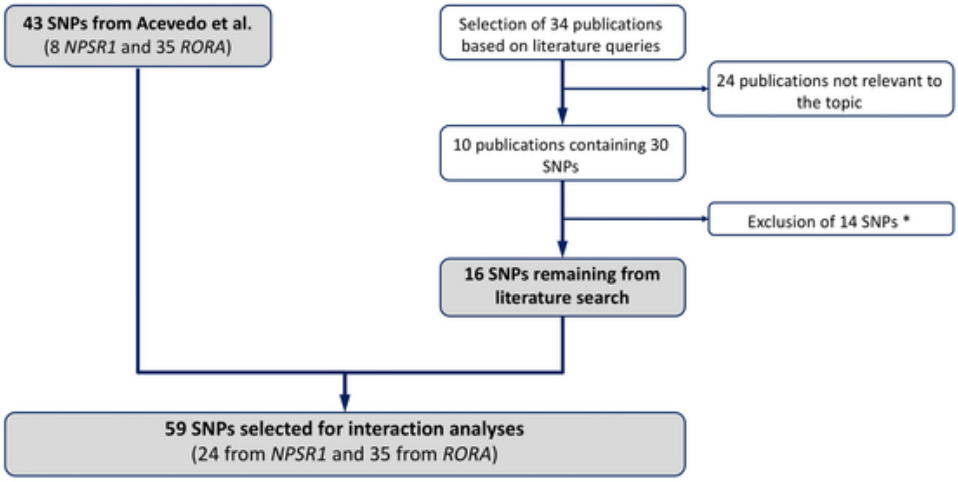
	NPSR1											
RORA	rs323922	rs324384	rs324396	rs324957	rs740347	rs1419779	rs324981	rs325462	rs17789420	rs34705969	rs727162	rs6972158
rs17191582	0.07 (0.18) 0.6911	-0.1 (-0.19) 0.6185	-0.07 (-0.21) 0.7428	-0.04 (-0.2) 0.8492	0.22 (0.23) 0.3505	0.36 (0.2) 0.0677	-0.07 (-0.2) 0.7359	0.18 (0.2) 0.3532	-0.03 (-0.3) 0.923	-0.27 (-0.45) 0.5508	-0.15 (-0.24) 0.5377	-0.14 (-0.2) 0.5003
rs6494221	0.05 (0.16) 0.75	0 (-0.17) 0.9936	0.06 (0.19) 0.7635	-0.02 (-0.17) 0.8985	0.32 (0.21) 0.1291	0.3 (0.18) 0.092	-0.09 (-0.17) 0.6123	0.18 (0.17) 0.2909	0.11 (0.26) 0.6655	0.27 (0.44) 0.5347	-0.2 (-0.2) 0.3092	-0.18 (-0.18) 0.3152
rs8043356	0.1 (0.2) 0.5972	-0.01 (-0.21) 0.9787	-0.3 (-0.3) 0.3065	-0.08 (-0.27) 0.7565	0.14 (0.4) 0.7194	0.09 (0.31) 0.782	0.06 (0.29) 0.8491	-0.05 (-0.29) 0.8528	0.04 (0.45) 0.9306	**1.34 (0.64)** **0.0379**	**0.62 (0.32)** **0.0496**	-0.08 (-0.26) 0.7584
rs12899193	0.13 (0.14) 0.3797	-0.15 (-0.15) 0.3233	-0.15 (-0.17) 0.3873	-0.16 (-0.15) 0.2989	0.35 (0.2) 0.0752	**0.33 (0.16)** **0.0386**	0.08 (0.16) 0.6076	-0.03 (-0.16) 0.861	0.2 (0.24) 0.4156	0.31 (0.41) 0.4444	0.04 (0.19) 0.852	-0.13 (-0.16) 0.425
rs12909890	0.05 (0.14) 0.6954	-0.16 (-0.14) 0.2394	-0.01 (-0.15) 0.9646	-0.09 (-0.14) 0.4966	0.08 (0.19) 0.6884	0.24 (0.15) 0.1085	0.06 (0.14) 0.6697	-0.01 (-0.14) 0.9412	-0.02 (-0.25) 0.9281	0.44 (0.39) 0.2536	-0.27 (-0.17) 0.1127	-0.08 (-0.16) 0.6208
rs8024629	-0.01 (-0.17) 0.9522	-0.08 (-0.18) 0.6483	0 (-0.19) 0.9919	-0.09 (-0.17) 0.5909	0.19 (0.22) 0.3856	**0.35 (0.18)** **0.0442**	-0.02 (-0.17) 0.9082	0.09 (0.17) 0.5815	-0.01 (-0.28) 0.96	0.39 (0.49) 0.4265	-0.21 (-0.21) 0.3247	0.02 (0.19) 0.9092
rs11635314	-0.09 (-0.19) 0.6429	0.19 (0.2) 0.3282	0.29 (0.22) 0.1887	0.29 (0.21) 0.1564	-0.02 (-0.26) 0.9406	-0.07 (-0.2) 0.7276	-0.14 (-0.2) 0.4934	0.25 (0.2) 0.2074	-0.09 (-0.34) 0.794	0.49 (0.54) 0.3695	-0.2 (-0.24) 0.4228	-0.1 (-0.21) 0.6343
rs4775289	0.13 (0.13) 0.3065	-0.23 (-0.13) 0.0772	-0.21 (-0.15) 0.1493	-0.22 (-0.13) 0.1018	**0.5 (0.18)** **0.006**	**0.43 (0.14)** **0.0015**	0 (0.13) 0.9747	-0.01 (-0.13) 0.9654	0.24 (0.23) 0.2962	-0.33 (-0.34) 0.332	-0.14 (-0.16) 0.3905	0.18 (0.14) 0.2266
rs17237367	-0.25 (-0.15) 0.1097	**0.33 (0.16)** **0.0457**	0.18 (0.17) 0.3076	0.25 (0.16) 0.1244	**-0.58 (-0.22)** **0.0087**	**-0.46 (-0.17)** **0.0085**	-0.01 (-0.16) 0.9536	0.02 (0.16) 0.914	-0.23 (-0.26) 0.3787	0.55 (0.54) 0.3081	0.12 (0.2) 0.5309	-0.14 (-0.17) 0.4128
rs17191596	0.15 (0.19) 0.4364	-0.12 (-0.21) 0.5471	-0.05 (-0.23) 0.8283	-0.13 (-0.21) 0.5357	0.18 (0.26) 0.5004	0.37 (0.22) 0.0929	-0.04 (-0.21) 0.8587	0.08 (0.22) 0.6961	-0.15 (-0.34) 0.6636	0.73 (0.55) 0.1857	-0.19 (-0.25) 0.4652	-0.06 (-0.23) 0.8074
rs4775292	-0.03 (-0.13) 0.793	-0.08 (-0.13) 0.5488	-0.06 (-0.15) 0.6943	-0.06 (-0.13) 0.6458	0.28 (0.17) 0.1032	0.26 (0.14) 0.0591	-0.04 (-0.13) 0.734	0.03 (0.13) 0.8328	0.27 (0.22) 0.2222	-0.35 (-0.36) 0.3248	-0.17 (-0.16) 0.3125	0.22 (0.15) 0.1396
rs17204367	0.01 (0.13) 0.9207	0.12 (0.13) 0.3531	0.1 (0.15) 0.5097	0.13 (0.13) 0.3388	-0.18 (-0.17) 0.3102	-0.07 (-0.14) 0.6036	-0.09 (-0.13) 0.5241	0.12 (0.13) 0.3717	-0.28 (-0.22) 0.2055	-0.1 (-0.39) 0.7932	0.16 (0.16) 0.3377	-0.17 (-0.14) 0.2233
rs17204395	0.1 (0.16) 0.542	-0.09 (-0.17) 0.6116	-0.16 (-0.19) 0.403	-0.11 (-0.17) 0.5355	0.05 (0.22) 0.8325	0.13 (0.17) 0.4614	0.06 (0.17) 0.7186	-0.08 (-0.17) 0.6214	0 (0.26) 0.9881	0.22 (0.55) 0.6824	0.09 (0.21) 0.6621	-0.12 (-0.17) 0.503
rs12437690	0.04 (0.13) 0.7764	0.12 (0.13) 0.343	0.08 (0.15) 0.6197	0.09 (0.13) 0.4846	0.02 (0.18) 0.8936	-0.04 (-0.14) 0.782	0.01 (0.13) 0.9624	0.08 (0.13) 0.5513	0.02 (0.21) 0.9328	0.49 (0.37) 0.1857	-0.01 (-0.17) 0.931	-0.06 (-0.14) 0.6812
rs9302215	0.06 (0.13) 0.636	0.08 (0.13) 0.564	0.02 (0.15) 0.8735	0.05 (0.13) 0.6891	0.05 (0.18) 0.7698	0.08 (0.14) 0.5765	0 (-0.13) 0.9828	0.05 (0.13) 0.705	0.01 (0.22) 0.9769	0.25 (0.36) 0.4938	-0.01 (-0.17) 0.9519	-0.12 (-0.14) 0.3772
rs17204440	0.04 (0.12) 0.7595	0.05 (0.12) 0.676	0.03 (0.14) 0.8589	0.04 (0.12) 0.7434	-0.1 (-0.17) 0.5595	-0.02 (-0.13) 0.8939	0.05 (0.13) 0.7006	0 (0.13) 0.9996	-0.16 (-0.21) 0.4475	0.14 (0.34) 0.6861	-0.01 (-0.16) 0.9383	**-0.35 (-0.14)** **0.0126**
rs7164773	-0.04 (-0.13) 0.7691	0.08 (0.13) 0.5413	0.09 (0.15) 0.5351	0.05 (0.13) 0.6759	0.07 (0.18) 0.6725	0.07 (0.14) 0.5815	-0.02 (-0.13) 0.8562	0.08 (0.13) 0.5661	0.05 (0.21) 0.8148	0.6 (0.38) 0.1133	-0.21 (-0.17) 0.2193	-0.05 (-0.13) 0.7082
rs10519067	0.04 (0.2) 0.8363	-0.07 (-0.21) 0.7437	-0.13 (-0.23) 0.5819	-0.06 (-0.21) 0.7909	-0.28 (-0.28) 0.3116	-0.24 (-0.21) 0.2515	0.16 (0.22) 0.4605	-0.18 (-0.22) 0.4158	-0.2 (-0.31) 0.5201	-0.14 (-0.58) 0.806	0.13 (0.24) 0.575	-0.37 (-0.21) 0.0718
rs12438866	0.03 (0.13) 0.8145	-0.06 (-0.13) 0.652	-0.08 (-0.15) 0.5631	-0.07 (-0.13) 0.5953	-0.12 (-0.17) 0.4779	-0.1 (-0.14) 0.4885	0.17 (0.13) 0.2043	-0.12 (-0.13) 0.3534	-0.06 (-0.22) 0.7728	0.65 (0.4) 0.1036	0.04 (0.17) 0.8314	**-0.28 (-0.14)** **0.0493**
rs17204454	-0.05 (-0.12) 0.7125	-0.04 (-0.13) 0.7461	0.02 (0.14) 0.8958	-0.01 (-0.13) 0.9358	0.09 (0.17) 0.5883	0.11 (0.14) 0.4058	-0.08 (-0.13) 0.5156	0.02 (0.13) 0.8698	0.12 (0.21) 0.5907	-0.43 (-0.36) 0.2291	-0.03 (-0.16) 0.8446	**0.28 (0.14)** **0.0431**
rs922782	0 (0.13) 0.9927	-0.08 (-0.13) 0.5272	-0.09 (-0.14) 0.5215	-0.07 (-0.13) 0.5802	0.19 (0.18) 0.2766	0.22 (0.14) 0.1104	0.01 (0.13) 0.9116	-0.03 (-0.13) 0.7927	0.18 (0.21) 0.3836	-0.11 (-0.33) 0.739	0.02 (0.15) 0.8975	0.06 (0.13) 0.6261
rs7173227	0.01 (0.18) 0.9731	0.14 (0.19) 0.4468	0.05 (0.2) 0.8145	0.06 (0.19) 0.7609	-0.13 (-0.27) 0.6198	-0.19 (-0.22) 0.393	0.09 (0.2) 0.6466	0.04 (0.2) 0.838	-0.03 (-0.34) 0.9251	-0.01 (-0.52) 0.9874	-0.06 (-0.24) 0.8113	0.14 (0.19) 0.4688
rs2899662	0.07 (0.13) 0.568	-0.16 (-0.13) 0.2146	-0.09 (-0.15) 0.5639	-0.11 (-0.13) 0.4251	0.21 (0.18) 0.2242	0.14 (0.14) 0.3005	-0.03 (-0.14) 0.8251	-0.02 (-0.13) 0.9086	0.16 (0.24) 0.5035	-0.54 (-0.35) 0.129	-0.15 (-0.16) 0.366	**0.3 (0.14)** **0.0382**
rs341459	-0.07 (-0.14) 0.5929	0.04 (0.14) 0.7554	0.01 (0.15) 0.9575	0.02 (0.14) 0.8863	0 (0.18) 0.9971	0.12 (0.15) 0.404	0 (0.14) 0.9928	-0.02 (-0.14) 0.9045	0.09 (0.22) 0.6898	0.09 (0.35) 0.7965	0.06 (0.16) 0.6902	-0.15 (-0.14) 0.2957
rs10162630	0 (0.13) 0.9858	0.06 (0.13) 0.6474	0.03 (0.15) 0.8483	0.06 (0.13) 0.6559	-0.13 (-0.17) 0.4432	-0.11 (-0.14) 0.4037	0 (0.13) 0.9735	0 (-0.13) 0.9701	-0.12 (-0.22) 0.5837	0.04 (0.36) 0.919	0.23 (0.16) 0.1421	**-0.37 (-0.14)** **0.0073**
rs12591848	-0.12 (-0.22) 0.5926	0.35 (0.23) 0.1245	0.28 (0.25) 0.2667	0.32 (0.22) 0.1522	-0.29 (-0.32) 0.3721	-0.27 (-0.26) 0.3017	-0.28 (-0.24) 0.2534	0.33 (0.25) 0.1856	-0.25 (-0.39) 0.522	0.58 (0.52) 0.2603	0 (0.26) 0.9966	-0.07 (-0.22) 0.7448
rs7171681	0.08 (0.14) 0.5596	-0.26 (-0.14) 0.064	-0.29 (-0.16) 0.068	-0.23 (-0.14) 0.0917	0.2 (0.18) 0.2711	0.24 (0.14) 0.0984	0.07 (0.14) 0.6172	-0.13 (-0.14) 0.342	0.15 (0.24) 0.5264	-0.66 (-0.35) 0.0598	-0.13 (-0.17) 0.4453	**0.32 (0.15)** **0.0318**
rs7169281	-0.02 (-0.13) 0.8685	0.17 (0.13) 0.1854	0.17 (0.14) 0.2168	0.2 (0.13) 0.1189	-0.12 (-0.17) 0.4873	-0.2 (-0.13) 0.1362	-0.17 (-0.13) 0.1912	0.12 (0.13) 0.375	-0.04 (-0.21) 0.8603	0.19 (0.37) 0.5963	0.01 (0.15) 0.9656	0 (-0.13) 0.9955
rs10152719	-0.07 (-0.17) 0.6876	0 (0.18) 0.9808	-0.05 (-0.2) 0.7897	-0.03 (-0.18) 0.8802	0.05 (0.25) 0.8453	0.05 (0.19) 0.7903	0.05 (0.19) 0.7963	-0.05 (-0.19) 0.8064	-0.04 (-0.33) 0.8943	0.89 (0.5) 0.0738	0.14 (0.21) 0.5067	**-0.37 (-0.18)** **0.0413**
rs341382	0.02 (0.14) 0.8995	-0.17 (-0.15) 0.235	-0.21 (-0.16) 0.1948	-0.16 (-0.14) 0.2631	0.24 (0.18) 0.1884	0.24 (0.14) 0.088	0.01 (0.14) 0.9628	-0.04 (-0.14) 0.7882	0.17 (0.24) 0.4886	-0.61 (-0.35) 0.0854	-0.18 (-0.17) 0.2997	0.29 (0.15) 0.0582
rs341392	0.1 (0.16) 0.5255	-0.16 (-0.16) 0.3342	-0.04 (-0.18) 0.8385	-0.08 (-0.17) 0.6236	-0.09 (-0.23) 0.6846	-0.02 (-0.18) 0.9235	0.18 (0.18) 0.3128	-0.11 (-0.17) 0.5108	-0.18 (-0.31) 0.5541	0.48 (0.51) 0.3463	0.25 (0.2) 0.2096	**-0.46 (-0.17)** **0.0078**
rs6494229	-0.01 (-0.13) 0.9621	-0.17 (-0.13) 0.1827	-0.17 (-0.14) 0.2333	-0.16 (-0.13) 0.2026	0.24 (0.17) 0.1631	0.25 (0.13) 0.0613	0.14 (0.13) 0.2865	-0.13 (-0.13) 0.3405	0.32 (0.21) 0.1389	0.11 (0.37) 0.7584	0.05 (0.16) 0.7585	0.15 (0.14) 0.2792
rs8042149	0.05 (0.13) 0.7012	-0.21 (-0.13) 0.1032	-0.22 (-0.15) 0.1287	-0.19 (-0.13) 0.1506	-0.01 (-0.17) 0.933	0.22 (0.14) 0.1145	**0.32 (0.14)** **0.0203**	-0.23 (-0.14) 0.0922	0.21 (0.22) 0.3393	0.28 (0.42) 0.493	0.12 (0.16) 0.4455	0.19 (0.14) 0.1752
rs4775301	0.02 (0.13) 0.8539	-0.23 (-0.13) 0.0871	**-0.29 (-0.15)** **0.0437**	-0.24 (-0.13) 0.0679	0.11 (0.17) 0.5431	**0.31 (0.14)** **0.0271**	**0.3 (0.14)** **0.0266**	-0.25 (-0.14) 0.07	0.3 (0.22) 0.1752	0.01 (0.38) 0.9784	0.08 (0.16) 0.6239	0.17 (0.14) 0.2341
rs11071561	-0.04 (-0.14) 0.7671	-0.19 (-0.14) 0.1593	-0.17 (-0.15) 0.2724	-0.19 (-0.14) 0.1527	0.11 (0.17) 0.516	0.27 (0.14) 0.054	**0.3 (0.14)** **0.0285**	-0.24 (-0.14) 0.0875	0.41 (0.23) 0.0678	-0.14 (-0.38) 0.7139	-0.07 (-0.17) 0.6632	**0.29 (0.14)** **0.0416**

Supplementary Table S11. Complete replication results of interaction effects between *RORA* and *NPSR1* on asthma severity.

effect direction different to MAGICS/ISAAC
effect direction the same as in MAGICS/ISAAC
borderline significant replication
significant replication of interaction on asthma without nocturnal symptoms

NPSR1	*RORA*	Number of doctor and ED visits (MAGICS/ISAAC)	Poor asthma control (BAMSE)	Number of exacerbations (MAAS)
rs2609234	rs11635314	-0.83 (-0.27) **0.0018**	na	0.26 (0.2) 0.2011
	rs4775289	0.45 (0.18) **0.012**	na	-0.07 (-0.14) 0.6233
	rs4775292	0.43 (0.18) **0.0153**	na	0 (-0.16) 0.9928
	rs12437690	-0.51 (-0.18) **0.0039**	na	0.11 (0.15) 0.4558
rs714588	rs4775289	0.4 (0.14) **0.0037**	-0.17 (-0.33) 0.6054	-0.11 (-0.11) 0.323
	rs4775292	0.29 (0.14) **0.0391**	0.47 (0.37) 0.2067	-0.02 (-0.11) 0.8475
	rs17204454	0.26 (0.13) **0.0497**	0.43 (0.36) 0.2217	0.13 (0.11) 0.243
rs1963499	rs4775289	0.82 (0.29) **0.0047**	-0.96 (-0.63) 0.1286	-0.12 (-0.17) 0.48
	rs17191596	1.86 (0.59) **0.0016**	-1.73 (-0.8) 0.0297	-0.17 (-0.26) 0.5235
	rs10152719	-0.69 (-0.3) **0.0197**	1.06 (0.82) 0.1929	0.3 (0.24) 0.2146
rs2168890	rs4775289	0.63 (0.21) **0.002**	-0.88 (-0.63) 0.1617	-0.07 (-0.16) 0.6531
	rs17204395	0.48 (0.24) **0.0486**	na	-0.14 (-0.21) 0.5102
rs2530547	rs8024629	0.44 (0.19) **0.0208**	-0.07 (-0.67) 0.9138	-0.09 (-0.15) 0.563
	rs4775289	0.53 (0.14) **0.0002**	-0.04 (-0.45) 0.9284	-0.1 (-0.12) 0.3726
	rs341392	-0.38 (-0.18) **0.0382**	0.06 (0.5) 0.8982	0.06 (0.14) 0.6823
rs887020	rs17191582	0.45 (0.2) **0.026**	-0.14 (-0.7) 0.8378	-0.14 (-0.16) 0.383
	rs8024629	0.55 (0.18) **0.0017**	-0.3 (-0.68) 0.6623	-0.03 (-0.14) 0.8144
	rs17191596	0.51 (0.22) **0.0228**	-0.29 (-0.7) 0.6799	-0.1 (-0.16) 0.5126
	rs4775292	0.36 (0.14) **0.0095**	0.25 (0.57) 0.6614	0.04 (0.11) 0.7376
rs1379928	rs4775289	0.39 (0.16) **0.0166**	-0.25 (-0.44) 0.5605	-0.03 (-0.13) 0.7939
	rs4775292	0.34 (0.16) **0.0303**	0.49 (0.54) 0.3648	-0.09 (-0.14) 0.5139
rs963218	rs4775289	0.34 (0.13) **0.0122**	-0.15 (-0.49) 0.7628	-0.17 (-0.1) 0.1124
	rs17237367	-0.35 (-0.17) **0.0334**	0.38 (0.38) 0.3209	0.05 (0.13) 0.7366
rs2609215	rs17191582	1.09 (0.39) **0.0058**	na	-0.41 (-0.26) 0.1165
	rs8024629	0.83 (0.35) **0.0184**	-0.2 (-0.92) 0.8315	-0.16 (-0.22) 0.4805
	rs4775289	0.59 (0.24) **0.0135**	-0.77 (-0.46) 0.096	-0.08 (-0.18) 0.6824
	rs17191596	0.94 (0.41) **0.0209**	-0.17 (-0.94) 0.8589	-0.11 (-0.25) 0.6645

	rs17204395	0.78 (0.31) **0.0123**	0.21 (1.03) 0.8344	-0.06 (-0.23) 0.7982
	rs6494229	-0.66 (-0.25) **0.0099**	0.22 (0.66) 0.7405	0.1 (0.2) 0.6117
rs323917	rs17191582	1.31 (0.54) **0.0144**	na	-0.21 (-0.31) 0.504
	rs17191596	1.43 (0.58) **0.0135**	na	-0.01 (-0.31) 0.971
rs324384	rs17237367	0.33 (0.16) **0.0457**	0.22 (0.46) 0.6256	0.01 (0.13) 0.9436
rs324396	rs4775301	-0.29 (-0.15) **0.0437**	-0.57 (-0.6) 0.3435	-0.01 (-0.12) 0.9631
rs740347	rs4775289	0.5 (0.18) **0.006**	0 (-0.54) 0.9987	-0.21 (-0.16) 0.1822
	rs17237367	-0.58 (-0.22) **0.0087**	0.77 (0.43) 0.0722	-0.25 (-0.21) 0.235
rs1419779	rs12899193	0.33 (0.16) **0.0386**	na	-0.03 (-0.12) 0.8112
	rs8024629	0.35 (0.18) **0.0442**	na	-0.1 (-0.14) 0.475
	rs4775289	0.43 (0.14) **0.0015**	na	-0.12 (-0.11) 0.2999
	rs17237367	-0.46 (-0.17) **0.0085**	na	0.02 (0.15) 0.8908
	rs4775301	0.31 (0.14) **0.0271**	na	-0.03 (-0.12) 0.825
rs324981	rs8042149	0.32 (0.14) **0.0203**	0.79 (0.46) 0.0884	-0.03 (-0.1) 0.7405
	rs4775301	0.3 (0.14) **0.0266**	1.01 (0.43) **0.0204**	-0.03 (-0.11) 0.7607
	rs11071561	0.3 (0.14) **0.0285**	0.86 (0.67) 0.2016	0.09 (0.11) 0.4195
rs6972158	rs17204440	-0.35 (-0.14) **0.0126**	na	0 (0.11) 0.9764
	rs12438866	-0.28 (-0.14) **0.0493**	0.55 (0.42) 0.1939	-0.11 (-0.12) 0.3694
	rs17204454	0.28 (0.14) **0.0431**	-0.46 (-0.42) 0.2733	0 (0.12) 0.9978
	rs2899662	0.3 (0.14) **0.0382**	-0.28 (-0.43) 0.5126	0.02 (0.12) 0.8742
	rs10162630	-0.37 (-0.14) **0.0073**	0.04 (0.37) 0.908	-0.13 (-0.11) 0.2604
	rs7171681	0.32 (0.15) **0.0318**	-0.17 (-0.49) 0.7279	-0.05 (-0.12) 0.682
	rs10152719	-0.37 (-0.18) **0.0413**	-0.62 (-0.54) 0.2561	0.08 (0.16) 0.621
	rs341392	-0.46 (-0.17) **0.0078**	-0.71 (-0.46) 0.1237	0.06 (0.13) 0.6587
	rs11071561	0.29 (0.14) **0.0416**	-0.24 (-0.49) 0.6223	0.06 (0.12) 0.6222



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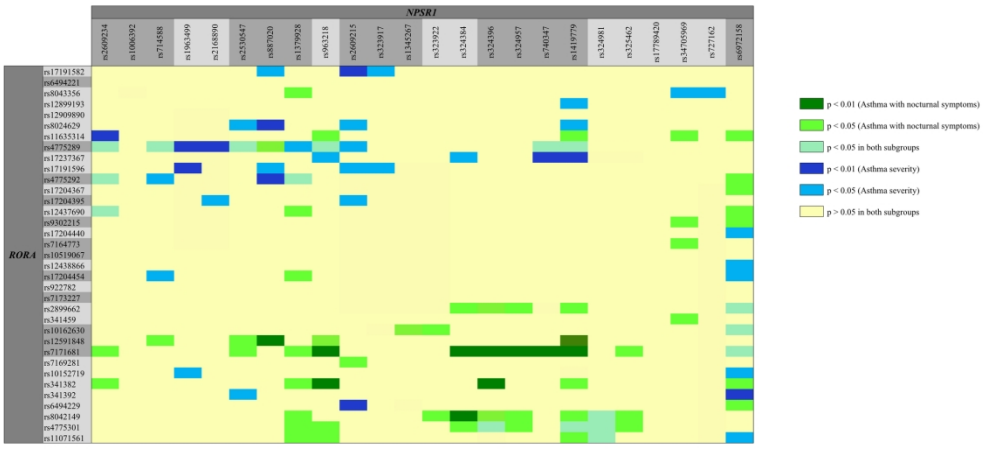

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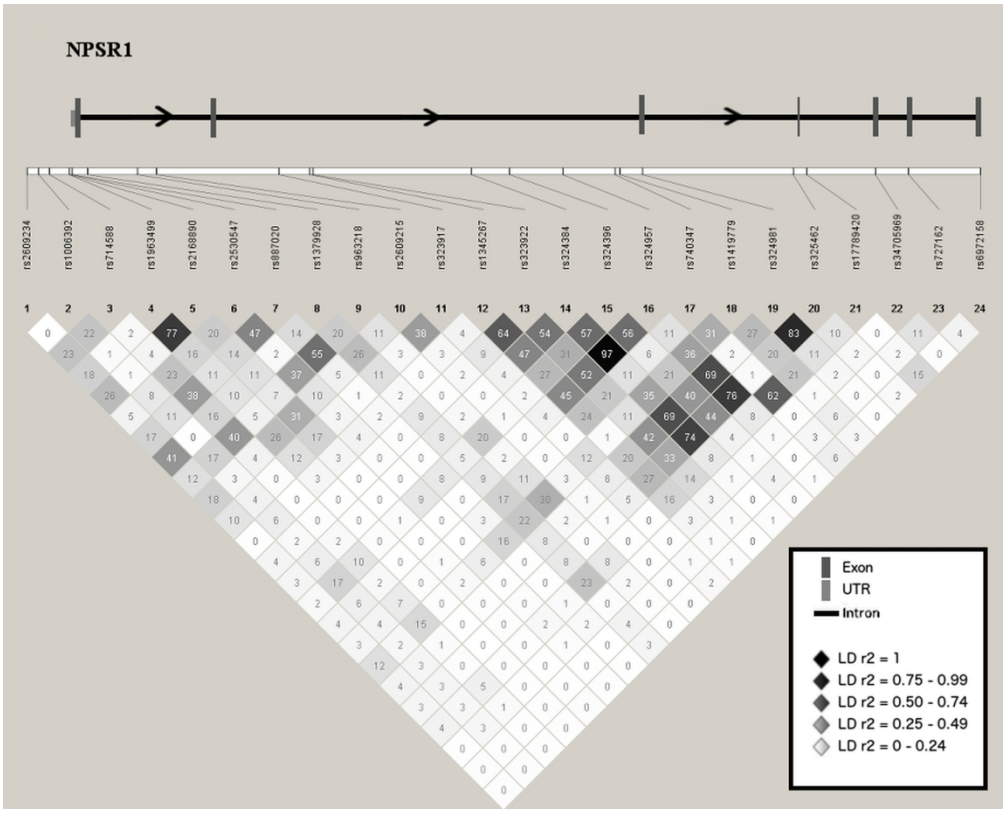

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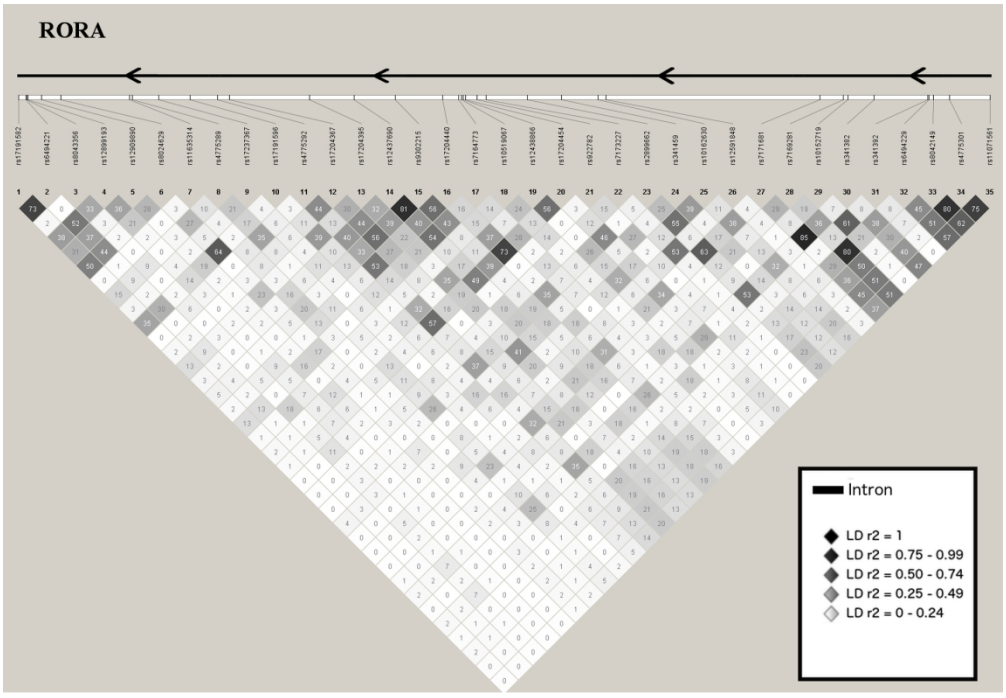

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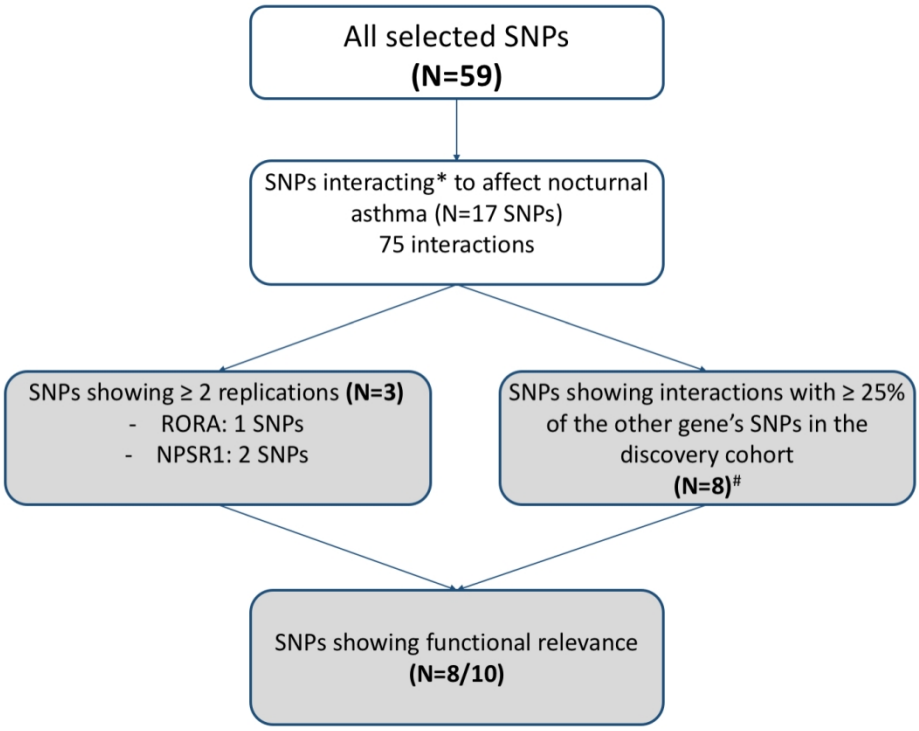

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