

National Birth Defect Registry

- The National Birth Defect Registry collects data on both structural (i.e. cleft palate, spina bifida) and functional (i.e. attention disorders, autism) birth defects and health, exposure and genetic histories in both parents.
- Exposures in cases of a particular birth defect are compared to all the non-exposed cases in the registry.
- The registry is used to detect patterns of birth defects with similar exposures. The use of malformed controls is well-established in the literature and offers the advantage of comparable levels of maternal recall bias in both study cases and controls.

Studies Using Malformed Controls

- [PLoS One](#). 2012;7(10):e46626. doi: 10.1371/journal.pone.0046626. Epub 2012 Oct 3.
Methodological approaches to evaluate teratogenic risk using birth defect registries: advantages and disadvantages.
- [Birth Defects Res A Clin Mol Teratol](#). 2006 Aug;76(8):592-601.
Maternal severe migraine and risk of congenital limb deficiencies
- [Eur J Epidemiol](#). 2006;21(1):65-75.
Population-based case-control study of the common cold during pregnancy and congenital abnormalities.
- [Birth Defects Res A Clin Mol Teratol](#). 2005 Dec;73(12):997-1005.
Population-based case-control study of isolated congenital cataract.
- [Paediatr Perinat Epidemiol](#). 2017 Nov;31(6):549-559. doi: 10.1111/ppe.12401. Epub 2017 Aug 25
Gastroschisis in Europe - A Case-malformed-Control Study of Medication and Maternal Illness during Pregnancy as Risk Factors.

Sudafed (pseudoephedrine)

Sudafed (pseudoephedrine) is an over-the-counter medication used for temporary relief of stuffy nose and sinus pain/pressure caused by colds, flu or allergic illnesses such as hay fever and allergies. It works by narrowing the blood vessels to decrease swelling and congestion.

In 2006, *the Combat Methamphetamine Epidemic Act* banned the over-the-counter sales of medicines containing pseudoephedrine, because it is commonly used to make methamphetamine. The sale of cold medicines containing pseudoephedrine is now limited to behind the counter.

Studies have found associations between pseudoephedrine and increases in certain birth defects including **ventricular septal defects, gastroschisis, intestinal atresia and Goldenhar Syndrome (hemifacial macrosomia)**. Animal studies have found abnormal sperm and lower sperm rates.

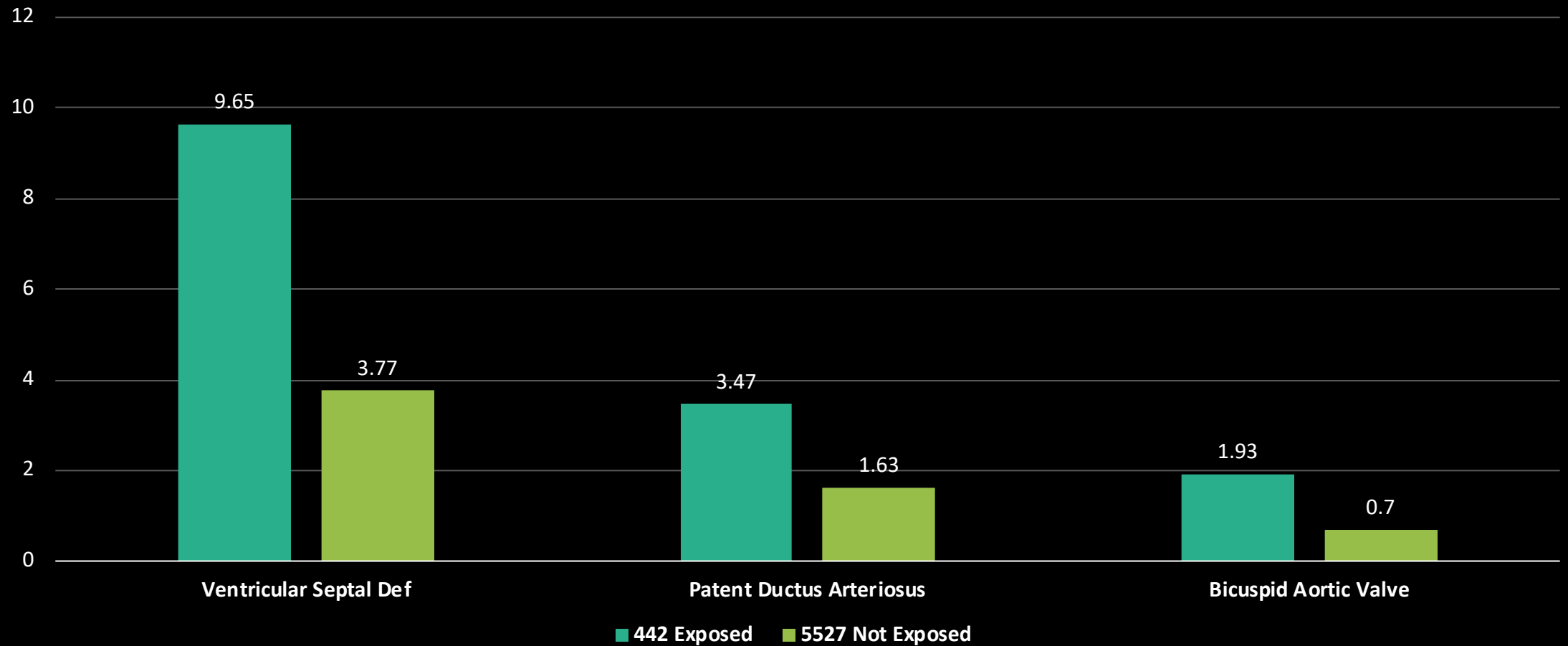
Pseudoephedrine						
1) Sperm abnormalities/ lower rates	https://www.ncbi.nlm.nih.gov/pubmed/22644002					
2) Ventricular septal defects	https://www.ncbi.nlm.nih.gov/pubmed/15448957					
3) Gastroschisis, Intestinal Atresia and Goldenhar (hemifacial macrosomia)	https://www.ncbi.nlm.nih.gov/pubmed/16933214					
4) Gastroschisis association.	https://www.ncbi.nlm.nih.gov/pubmed/12859037					
5) Gastroschisis...Sudafed and acetaminophin.	https://www.ncbi.nlm.nih.gov/pubmed/11772781					
6) Gastroschisis... Sudafed and acetaminophin	https://www.ncbi.nlm.nih.gov/pubmed/1533958					
7) Use of Decongestants During Pregnancy	https://academic.oup.com/aje/article/178/2/198/122453					

Results from the National Birth Defect Registry

In the National Birth Defect Registry, data on 442 Sudafed-exposed cases compared to 5527 non-exposed cases have shown increases of a doubling or more **for ventricular septal defects, gastroschisis, rectal/anal atresia, Goldenhar Syndrome (hemifacial macrosomia)** and other categories of structural birth defects that have not been the subject of published studies.

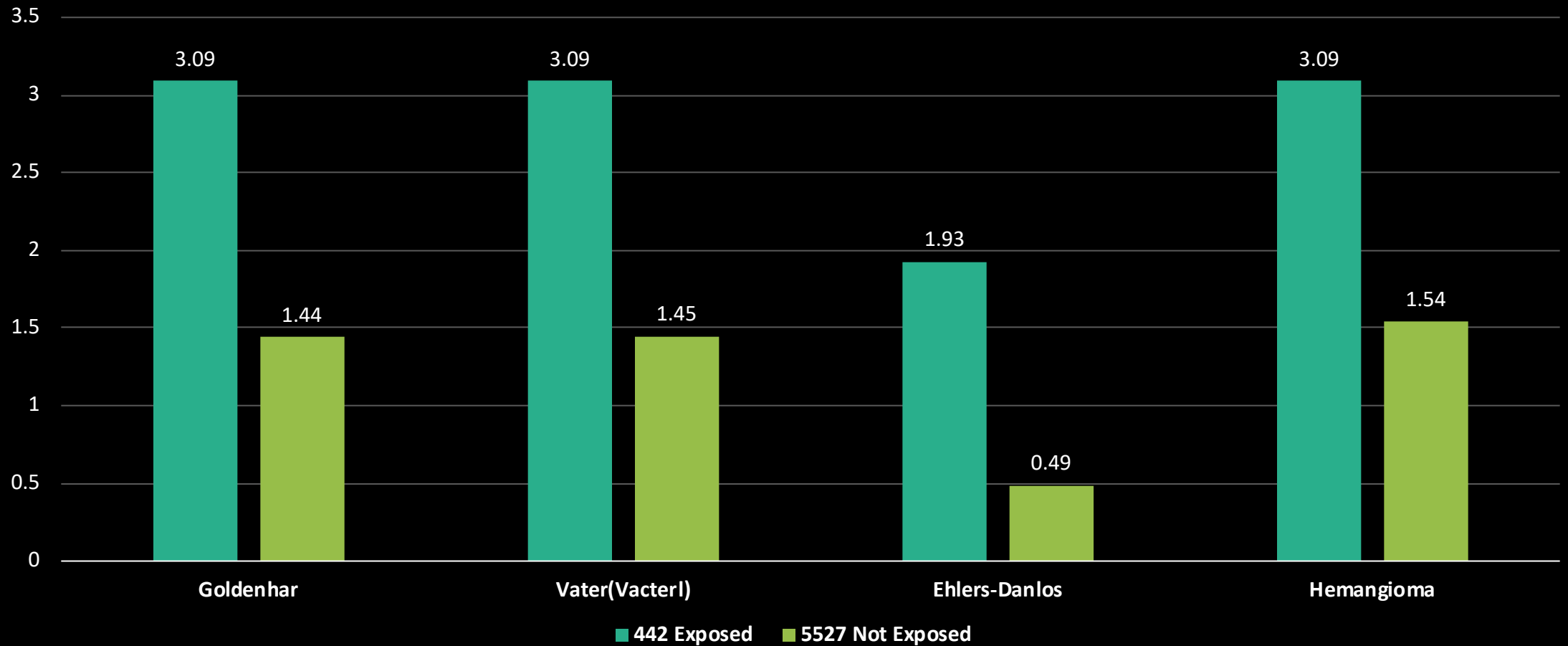
Sudafed

Heart



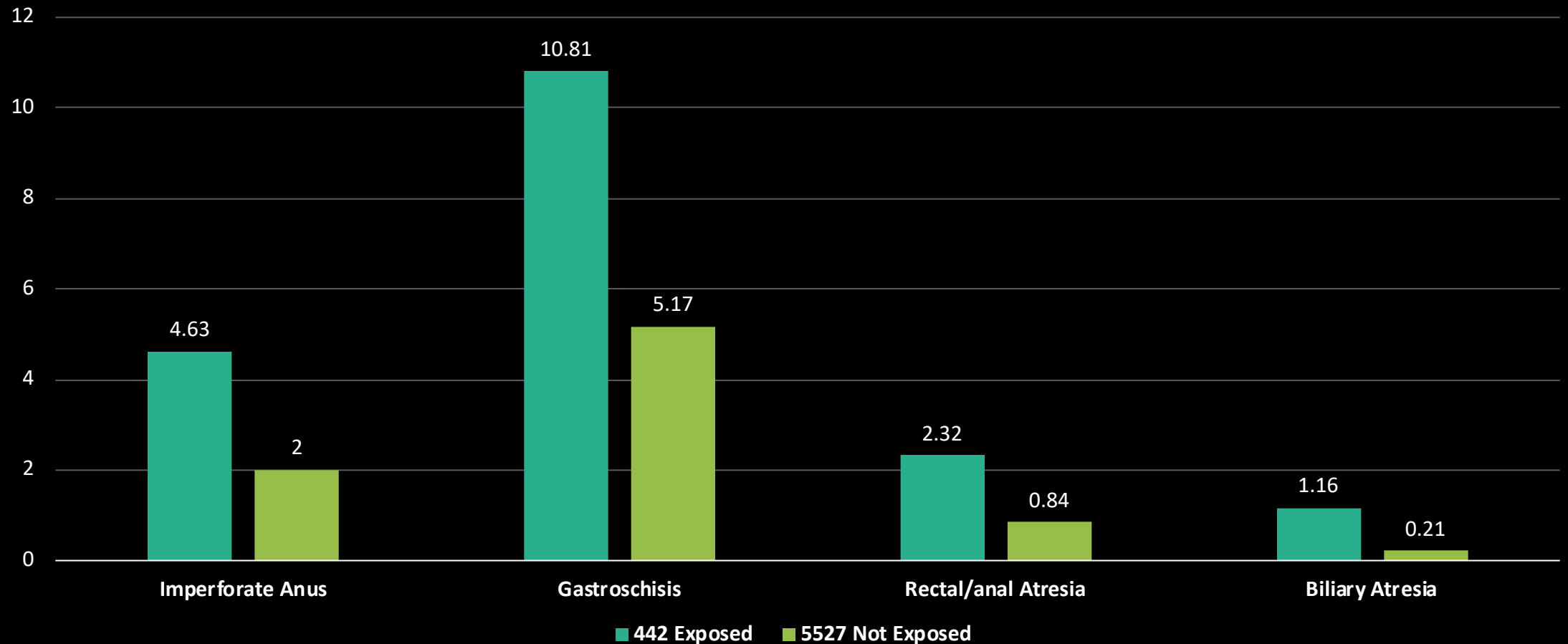
Sudafed

Syndromes & Tumors



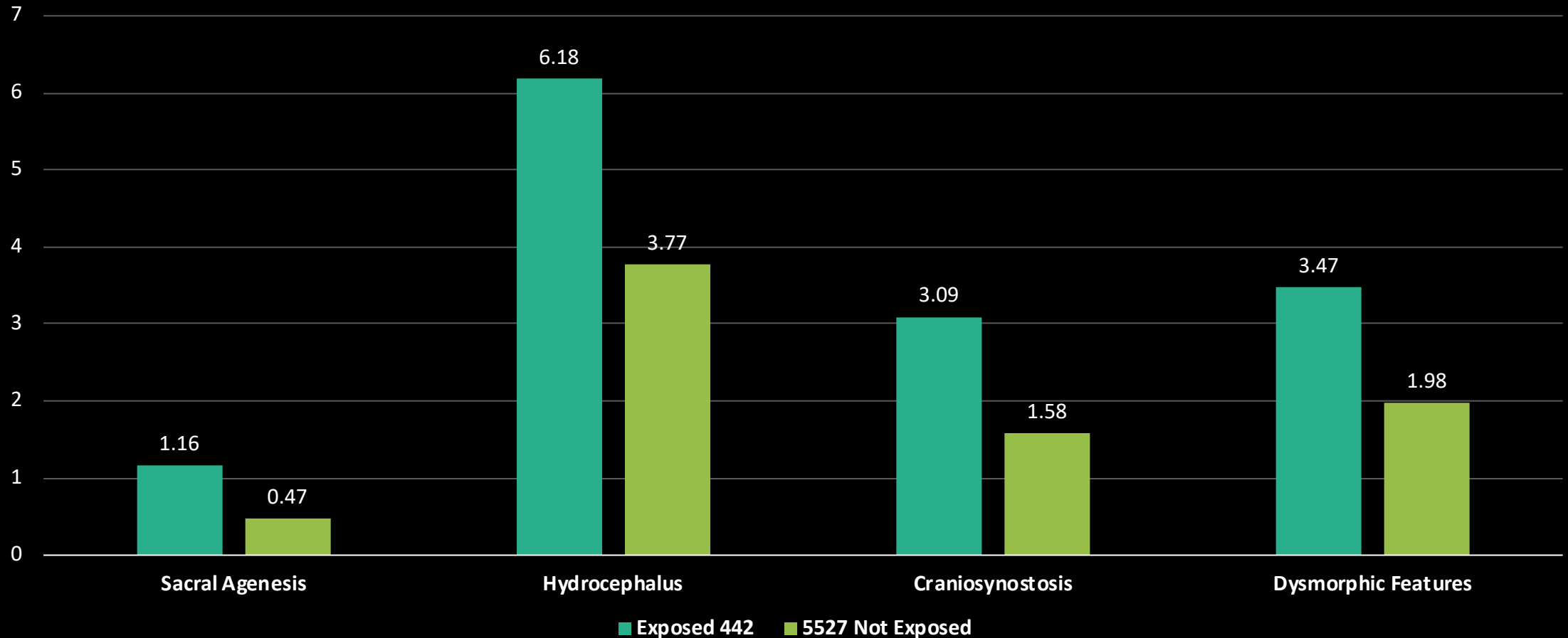
Sudafed

GI & Liver



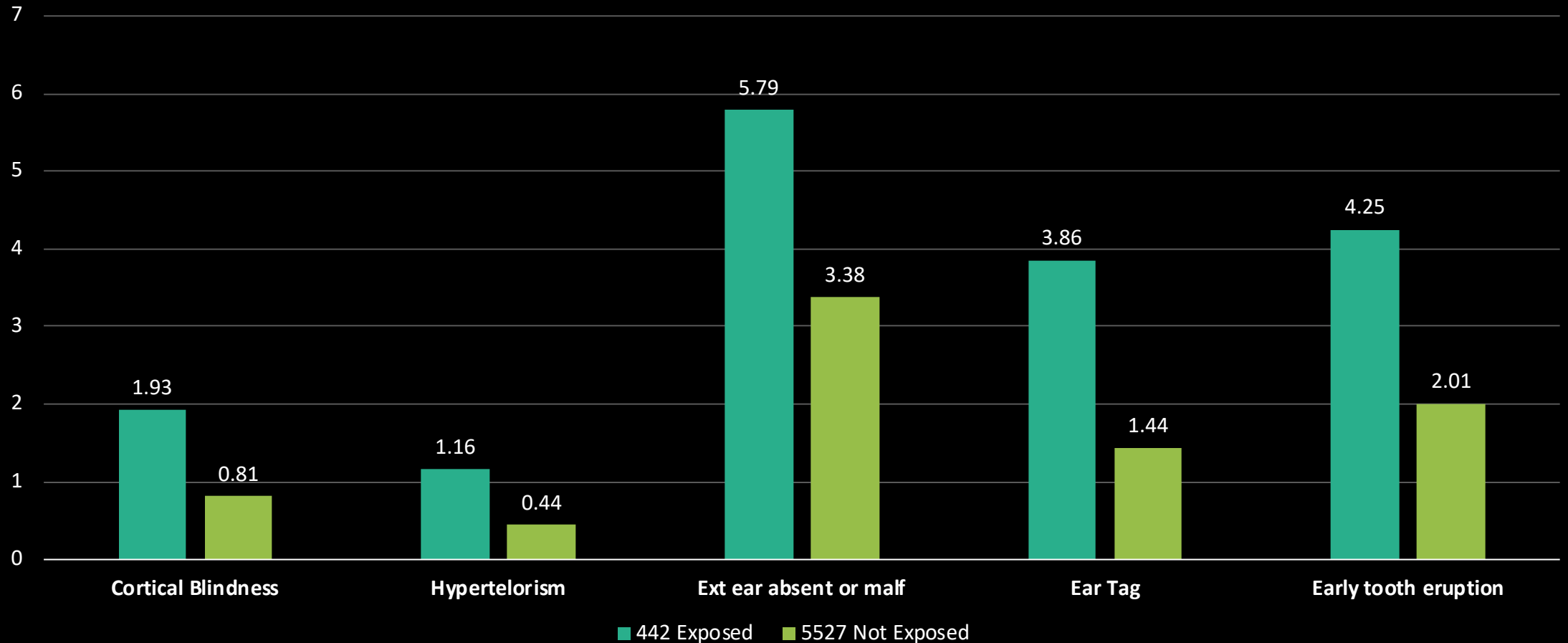
Sudafed

CNS & Cranial-facial



Sudafed

Eye, Ears & Teeth



Clomid (clomiphene)

Clomid (clomiphene citrate) is a medication used to treat infertility in women. It works by stimulating hormones so that ovaries release mature eggs.

Clomid is not available in Canada and there are some reports that the manufacturer may no longer make Clomid in the U.S.

Clomid has been associated with anencephaly, Dandy Walker, heart defects, cloacal exstrophy, omphalocele, tracheoesophageal fistula, craniosynostosis, autism and hypospadias.

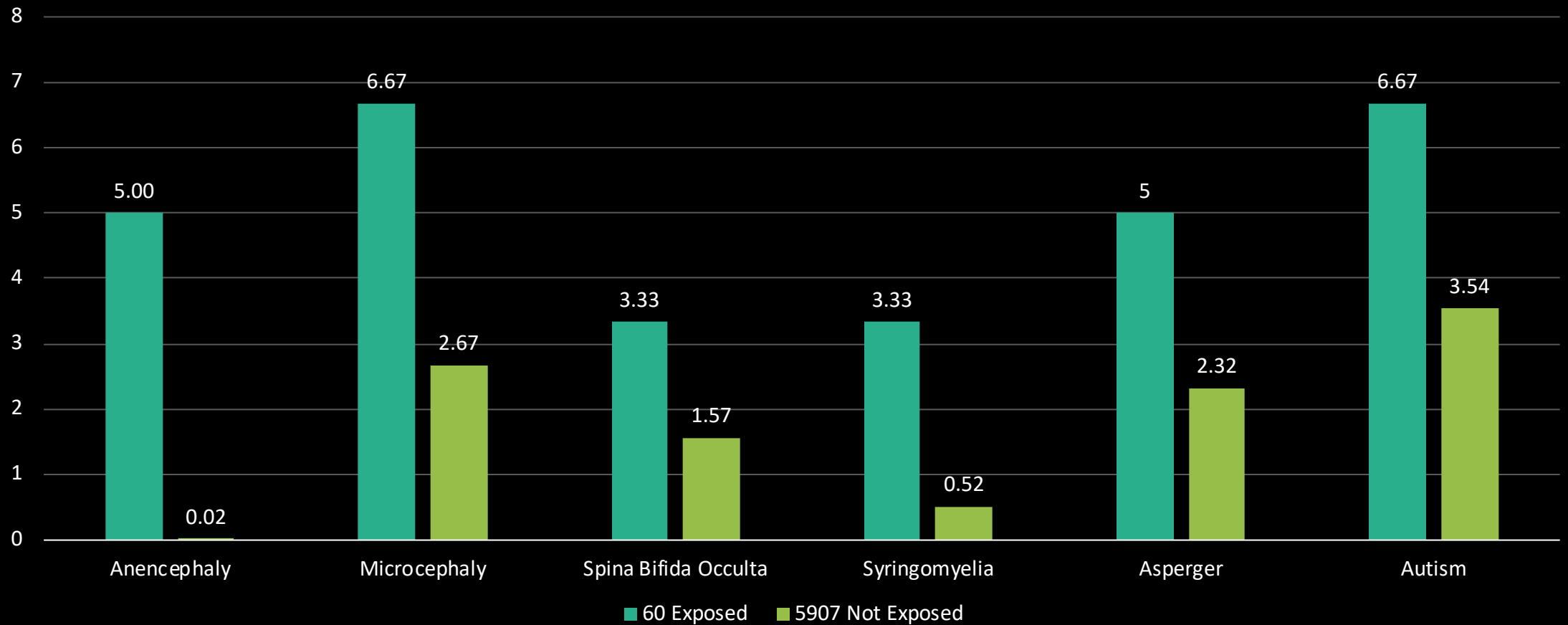
Clomid		
1) NTDs, TEF, Omphalocele et al	http://www.mblynchfirm.com/2018/08/28/australian-researchers-link-clomid-to-birth-defects/	
2) Anencephaly,Dandy Walker/Heart defects et al	https://www.ncbi.nlm.nih.gov/pubmed/?term=clomid+and+cloacal+exstrophy	
3) Hypospadias (mild / moderate)	https://www.ncbi.nlm.nih.gov/pubmed/16586447	
4) Hypospadias & NTDs	https://www.ncbi.nlm.nih.gov/pubmed/18519067	
5) NTDs and hypospadias	https://www.ncbi.nlm.nih.gov/pubmed/28547654	
6) Autism	http://blogs.edweek.org/edweek/speced/2010/05/research_links_autism_to_infer.html	
7) Craniosynostosis	https://www.ncbi.nlm.nih.gov/pubmed/23428561	

Results from the National Birth Defect Registry

Data from the National Birth Defect Registry on 60 Clomid-exposed case compared to 5907 non-exposed cases found increases in **tracheoophageal fistula, omphalocele, hypospadias, craniosynostosis, anencephaly and autism**. Certain heart defects, cloacal anomaly and Dandy Walker were also increased, but not included because they were based on less than 2 Clomid exposures.

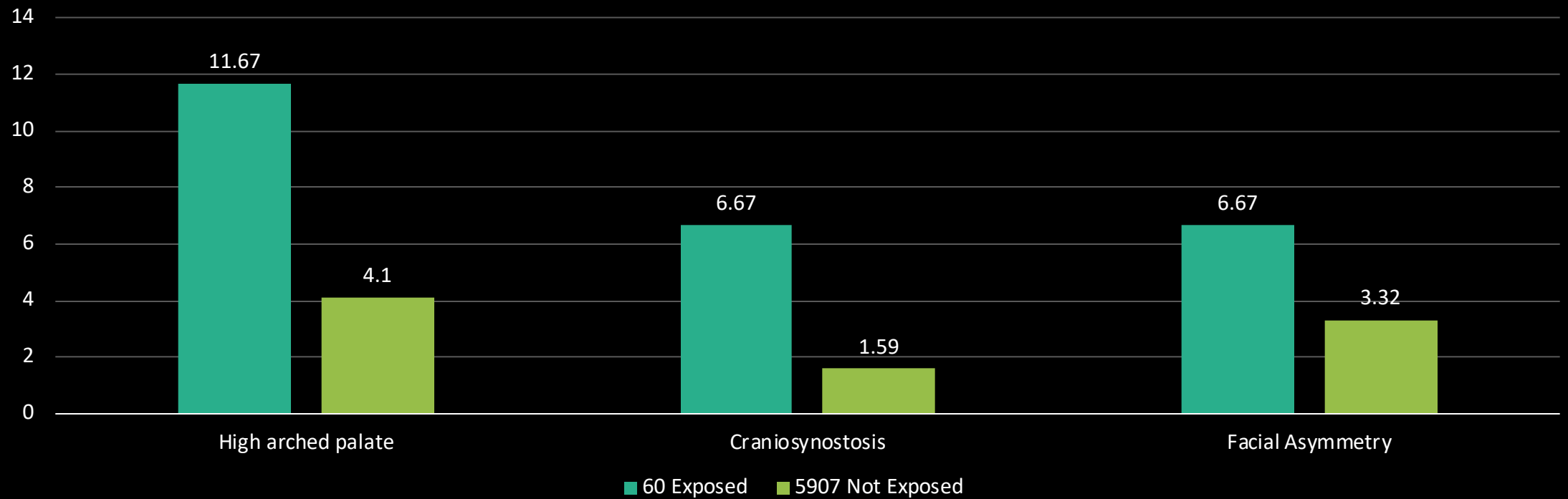
Clomid

CNS/Neurodevelopmental



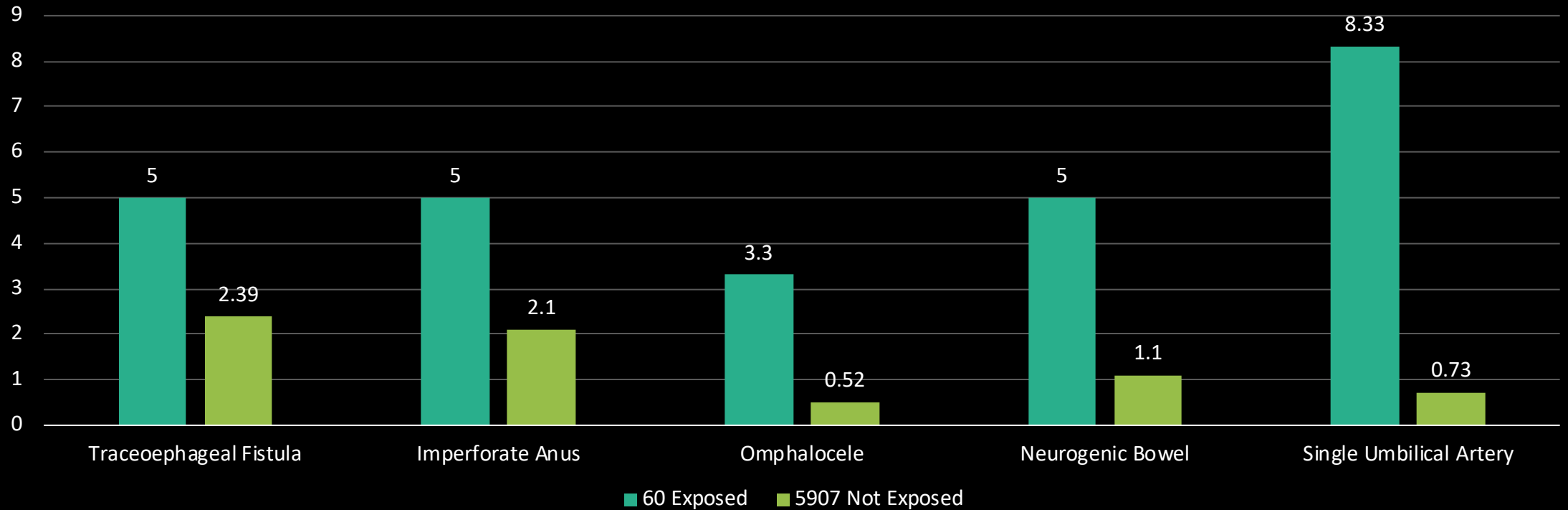
Clomid

Cranial-facial



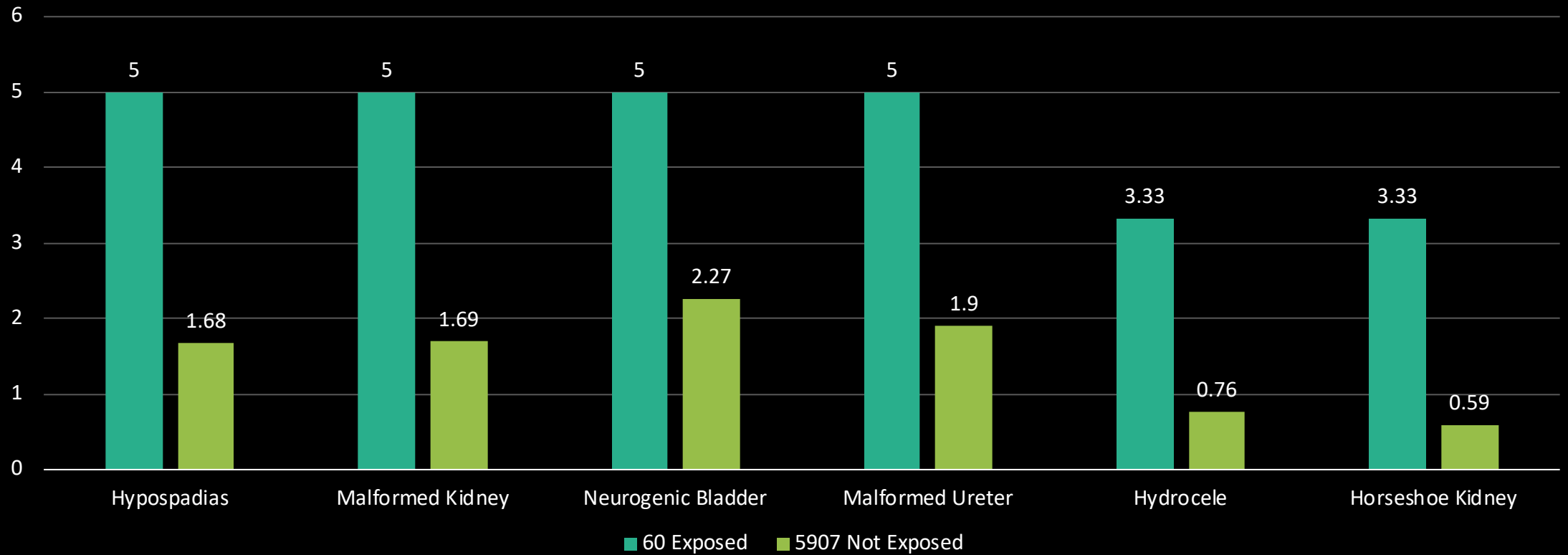
Clomid

Gastrointestinal



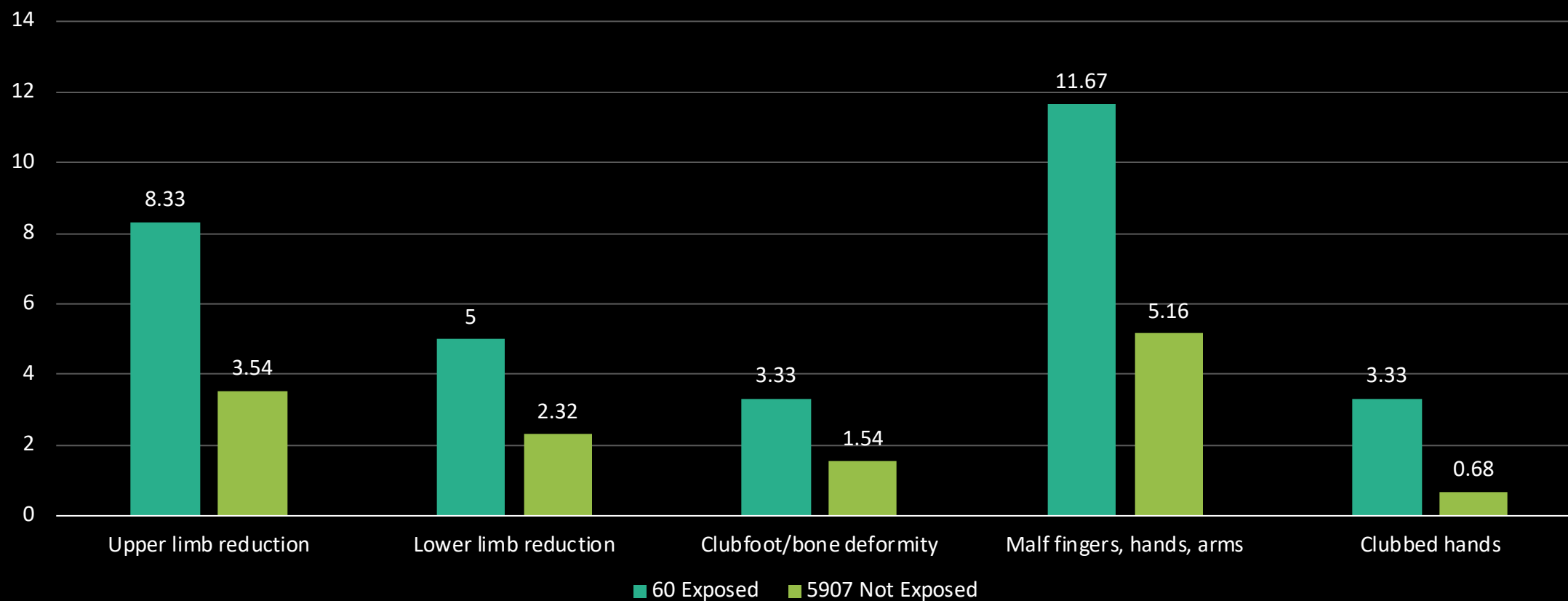
Clomid

Genitourinary



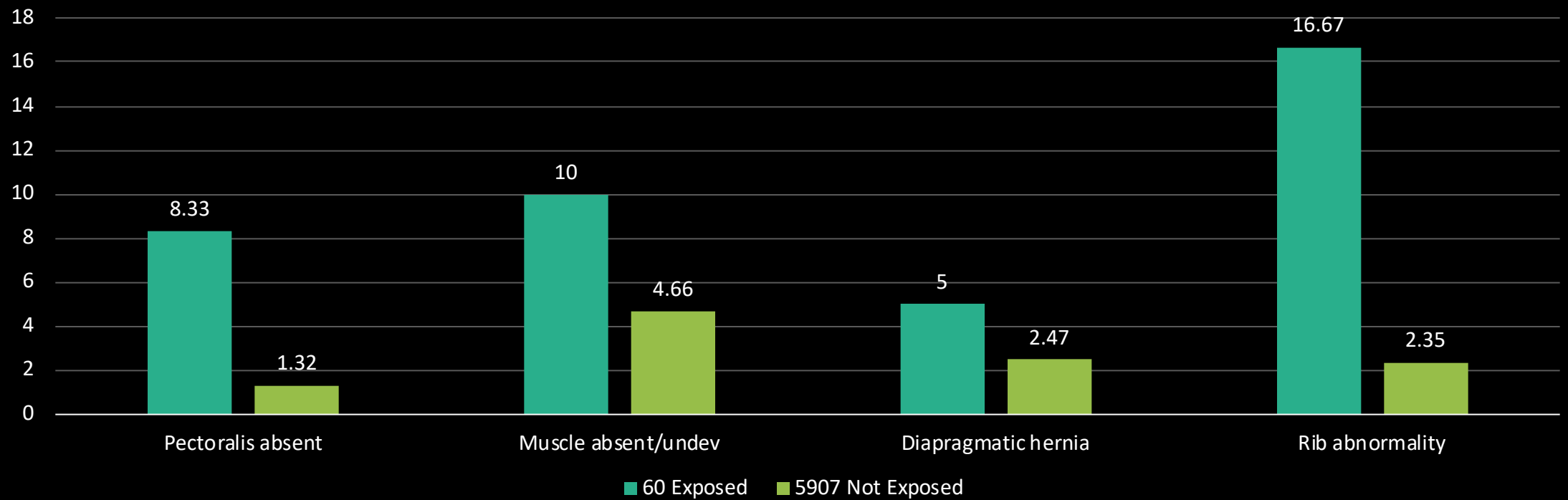
Clomid

Limb Malformations



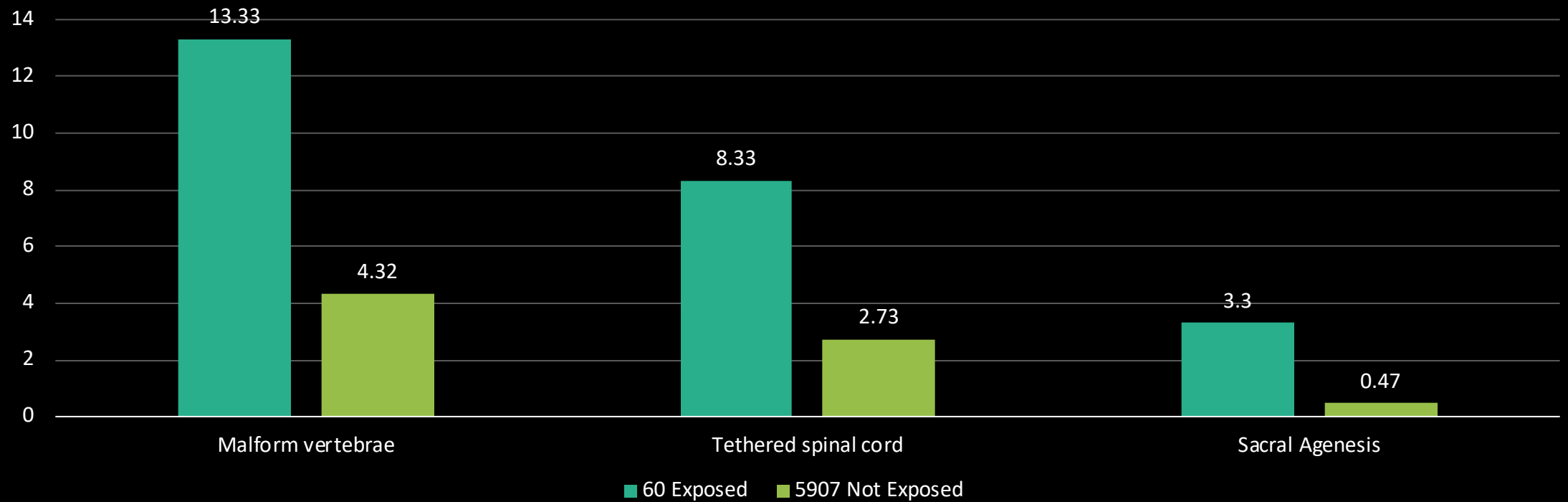
Clomid

Muscle/Ribs



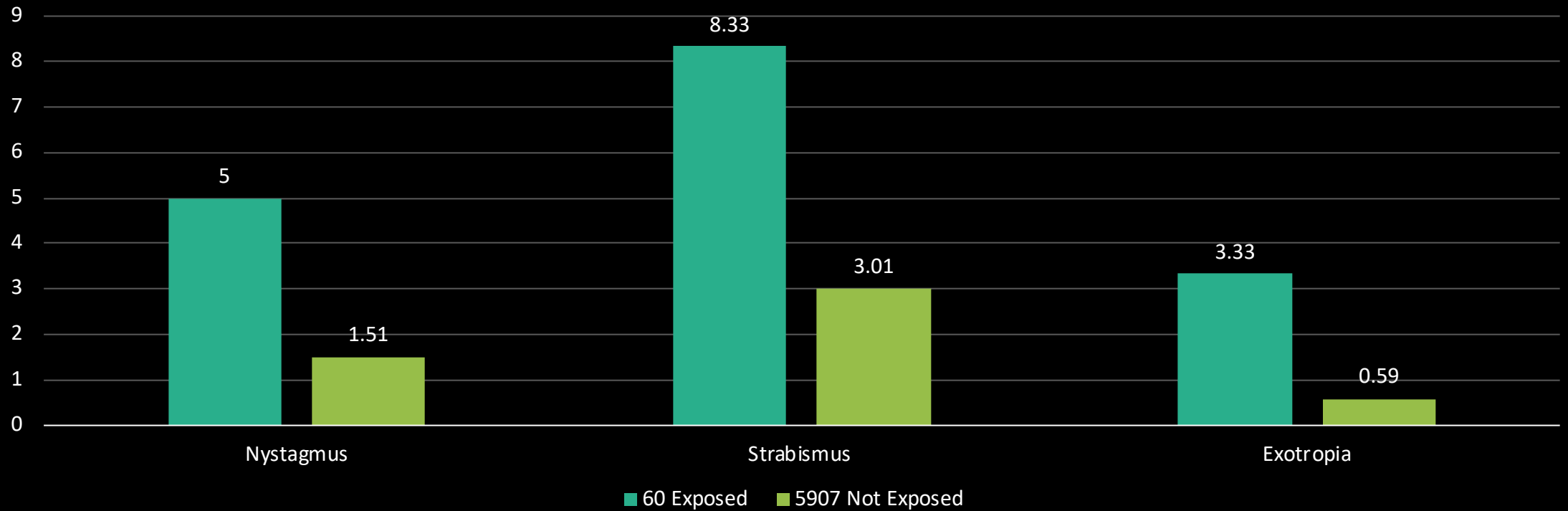
Clomid

Spine and Vertebrae



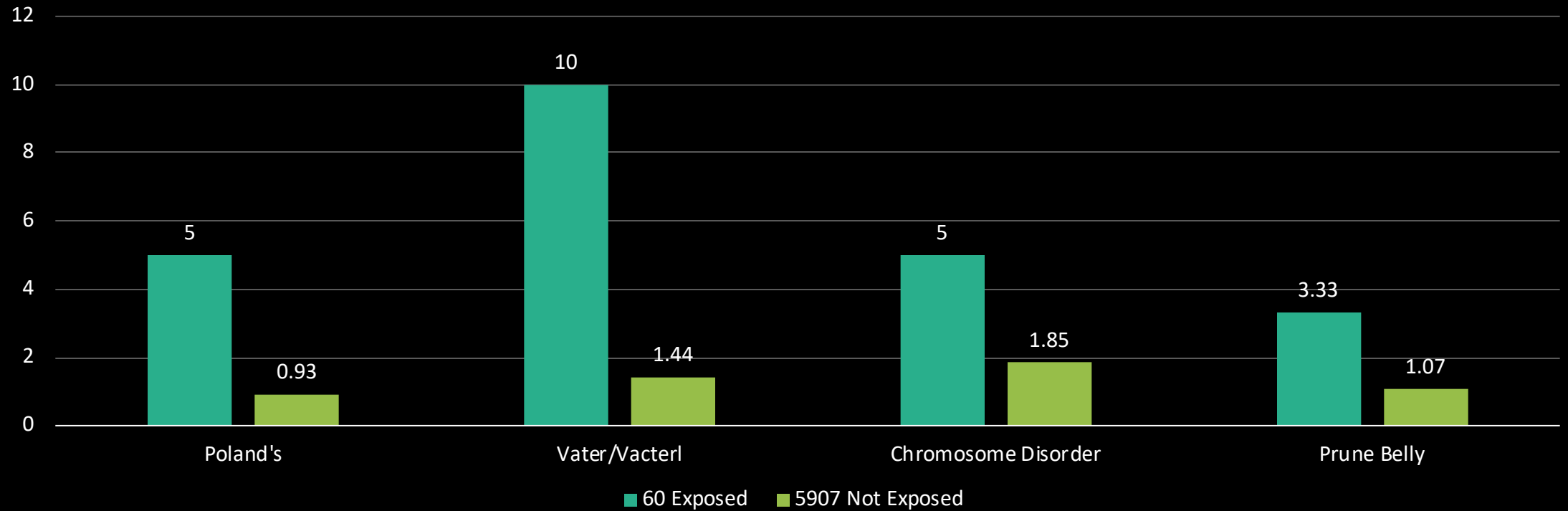
Clomid

Eye



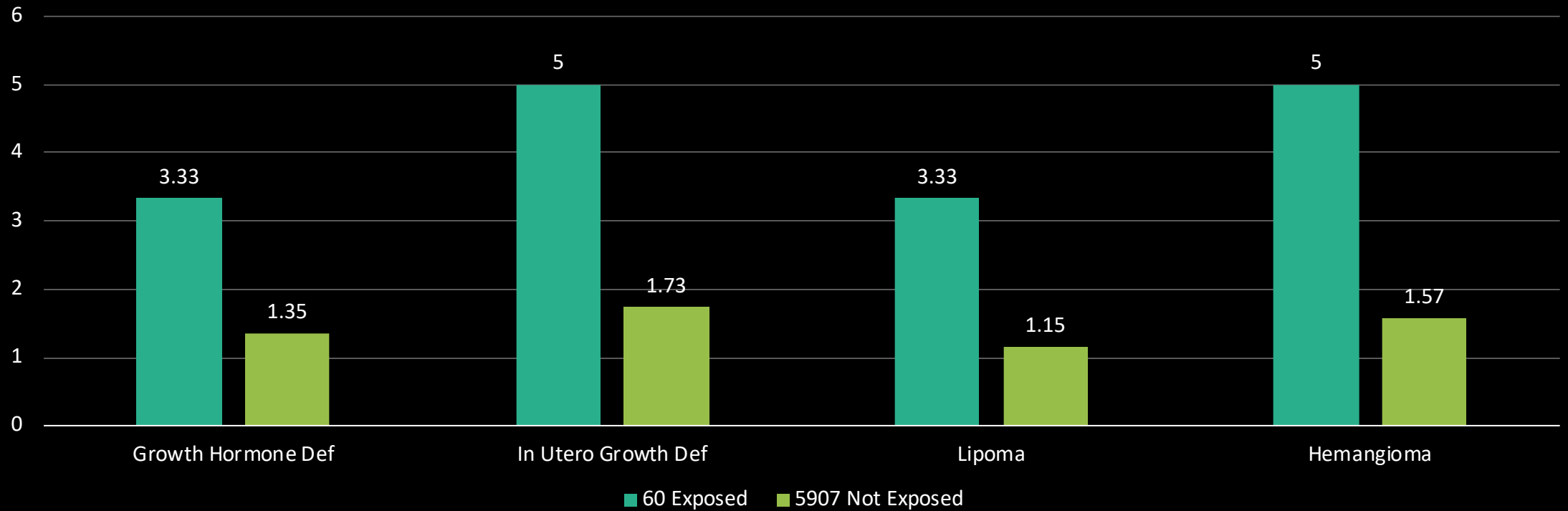
Clomid

Syndromes



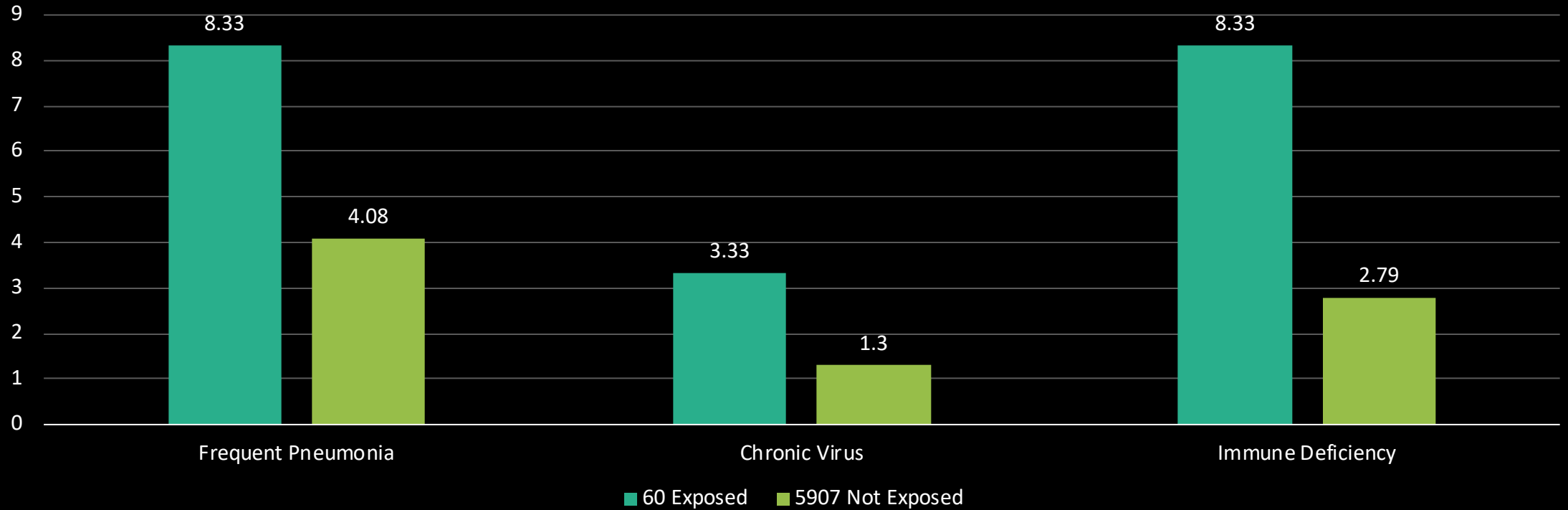
Clomid

Growth and Benign Tumors



Clomid

Immune Defects



Zoloft (sertraline)

Zoloft (sertraline hydrochloride) is a medication prescribed to treat depression as well as other disorders like OCD, panic and social anxiety and PTSD. Zoloft is classified as a selective serotonin reuptake inhibitor (SSRI). SSRIs affect serotonin in the brain and have been associated with birth defects.

The FDA categorizes Zoloft in Pregnancy Category C which means that reproductive studies in animals have shown evidence of fetal harm.

Published studies have found links between Zoloft and septal heart defects, clubfoot, oral clefts, autism, omphalocele and craniosynostosis.

Zoloft	
1)Heart defects, VSDs, ASDS	https://www.ncbi.nlm.nih.gov/pubmed/27770542
2)ASDs/VSDs Craniosynostosis	https://www.ncbi.nlm.nih.gov/pubmed/25637841
3)Clubfoot	https://www.ncbi.nlm.nih.gov/pubmed/25171134
4)Septal heart defects	https://www.ncbi.nlm.nih.gov/pubmed/19776103
5)Omphalocele/septal defects	https://www.ncbi.nlm.nih.gov/pubmed/17596601
6)Autism	https://www.bmj.com/content/346/bmj.f2059

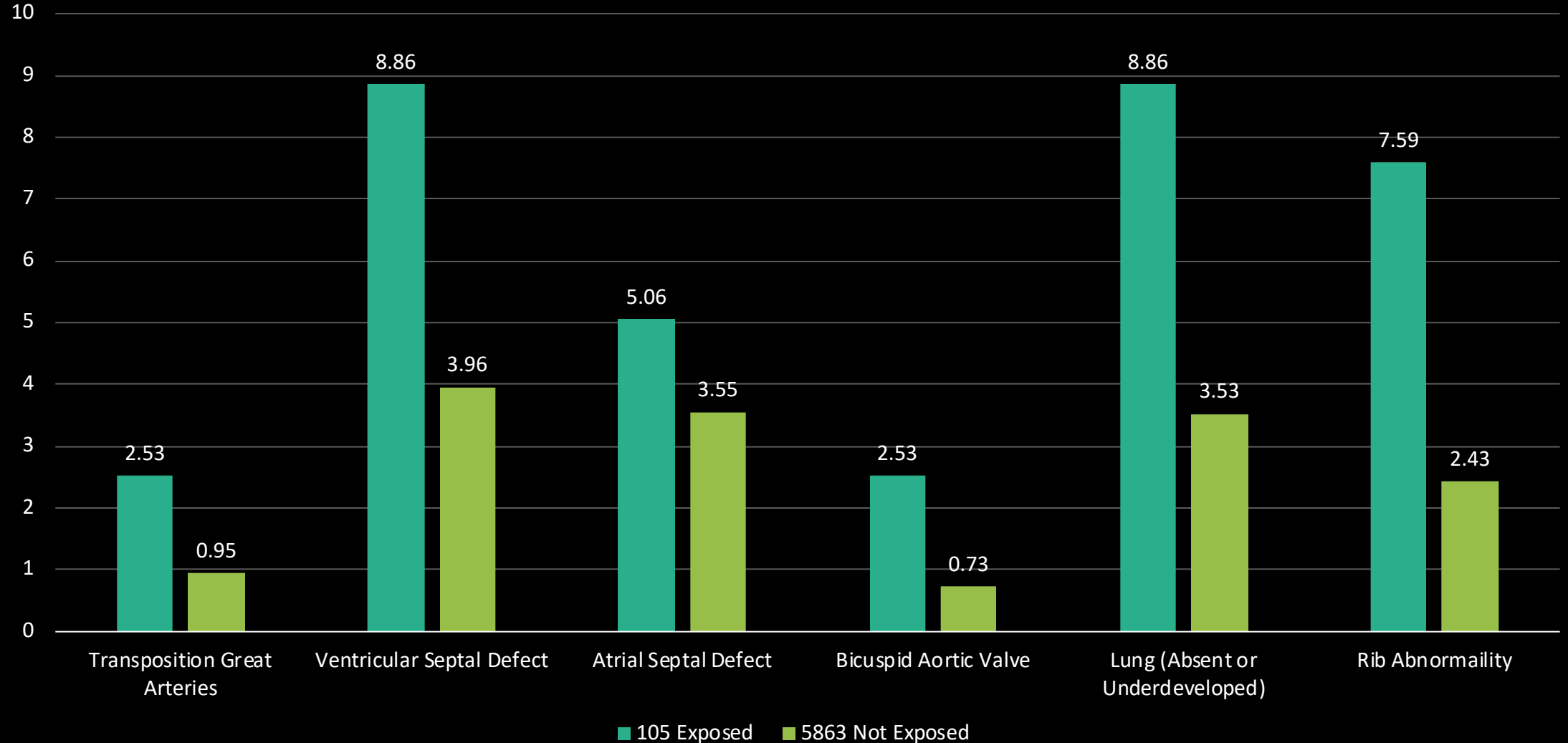
Results from the National Birth Defect Registry

Data from the National Birth Defect Registry compared birth defects in 105 Zoloft-exposed cases to 5863 non-exposed cases.

Increases were found for **septal heart defects, clubfoot and autism** also found in published studies. Omphalocele was increased, but not included since less than 2 cases were exposed to Zoloft.

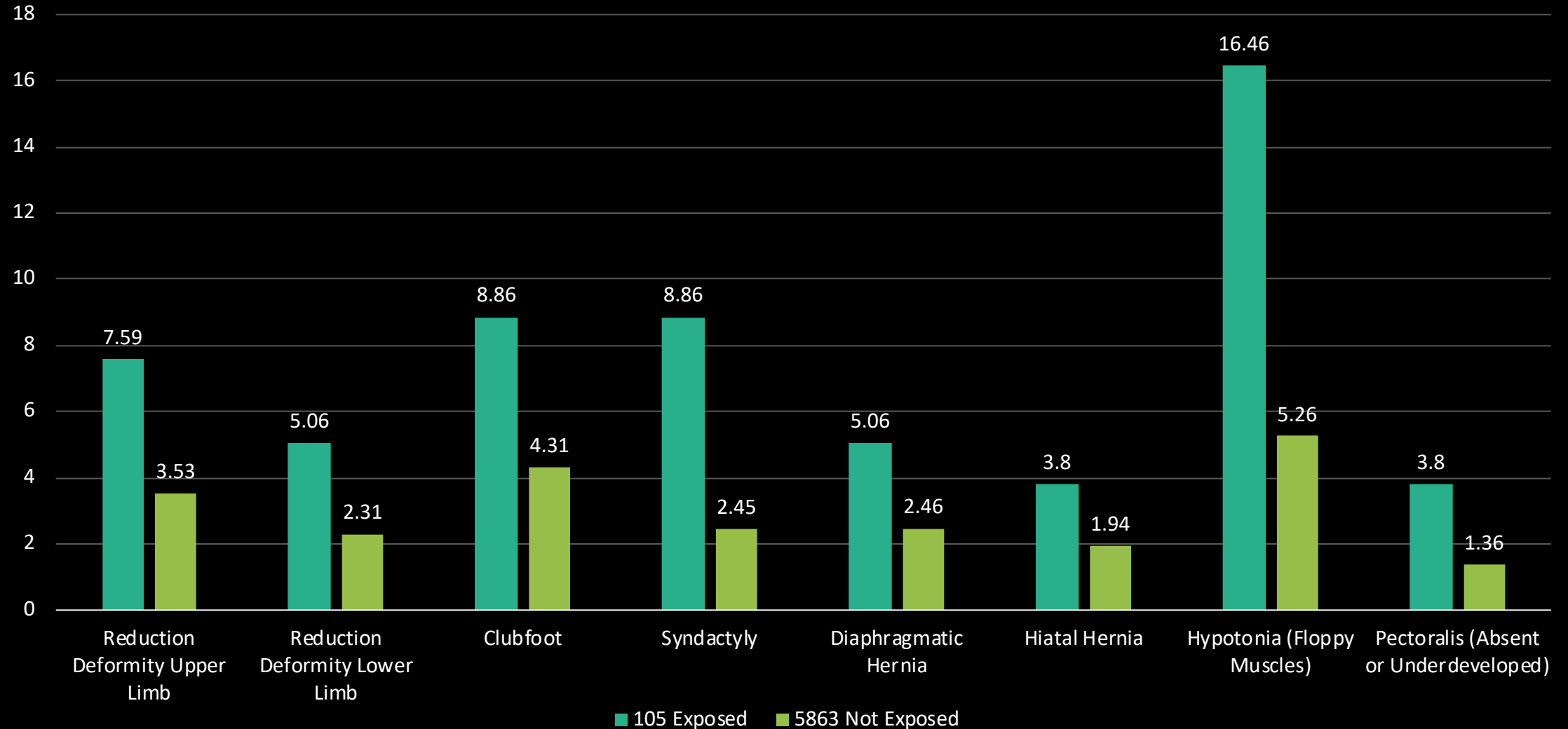
Zoloft

Heart and Lung



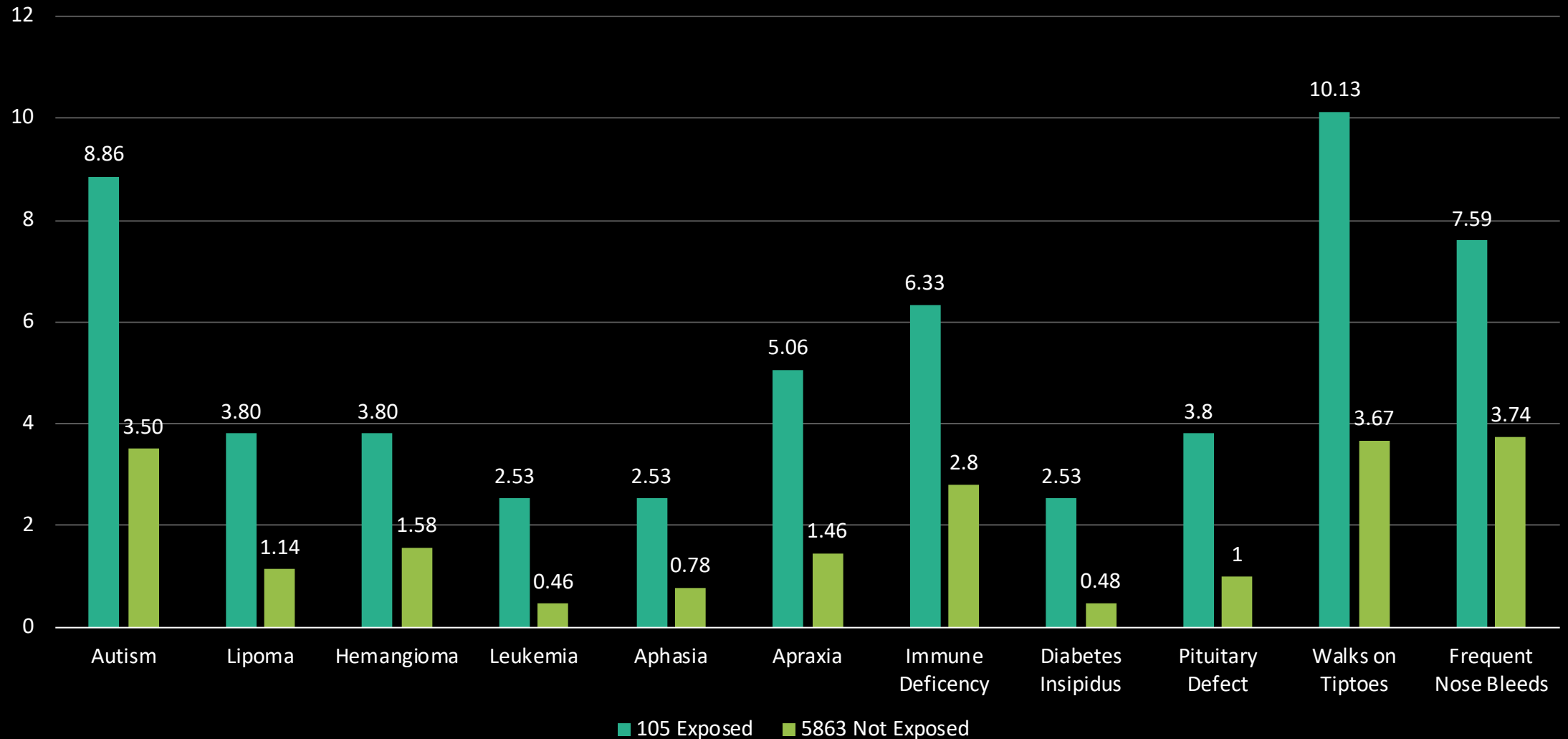
Zoloft

Limb and Muscle



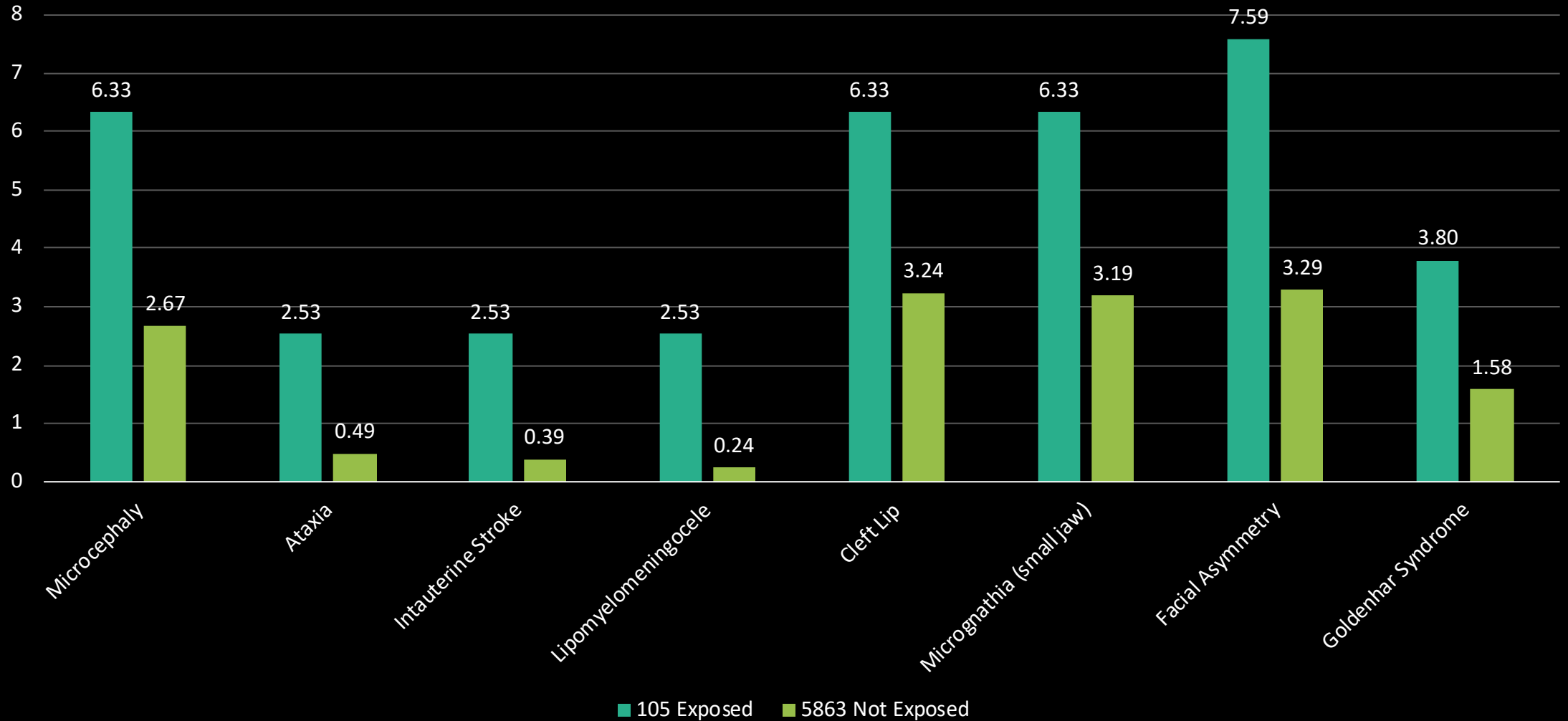
Zoloft

Other birth defects



Zoloft

CNS and Craniofacial



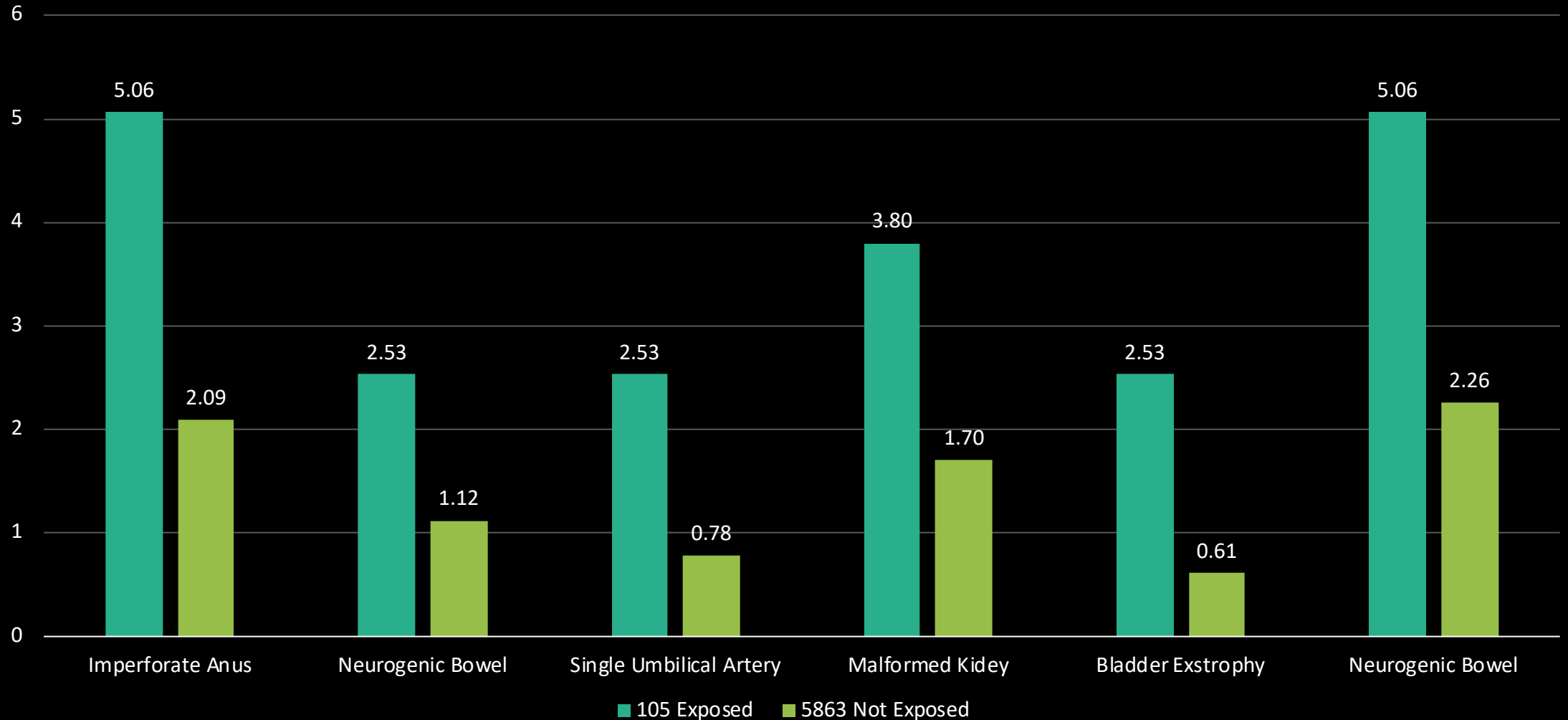
Zoloft

Ear and Eyes



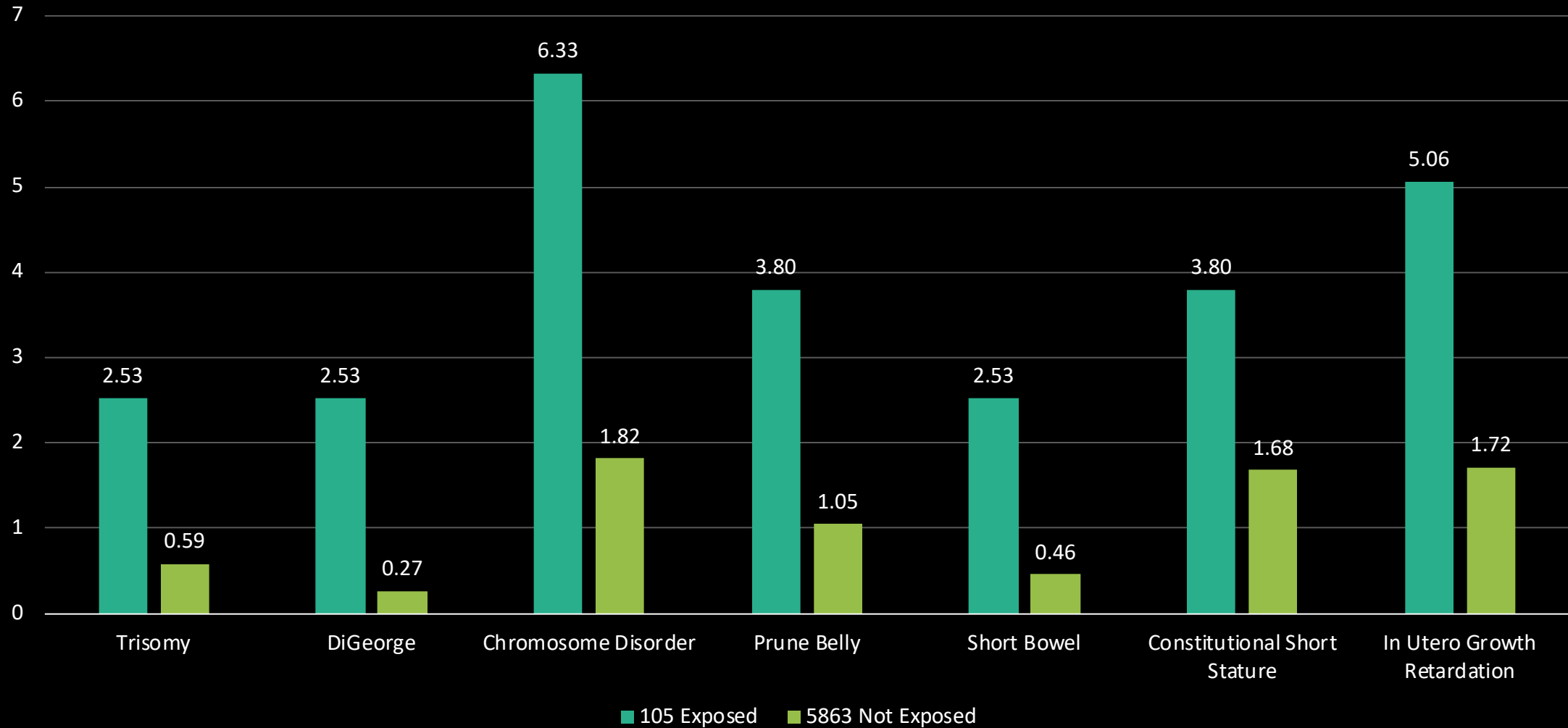
Zoloft

Gastrointestinal and Genitourinary



Zoloft

Growth Disorders and Syndromes



Zofran (ondansetron)

Zofran (ondansetron) is an anti-nausea drug and selective 5-HT₃ receptor antagonist prescribed for the treatment of nausea and vomiting due to cancer chemotherapy and also used to prevent and treat nausea and vomiting after surgery.

Zofran is not an FDA approved medication for pregnant women experiencing morning sickness and should not be taken during pregnancy.

Published studies have found significant associations between Zofran and heart defects, clefts and renal agenesis.

Zofran	
Heart defects/clefts	https://www.ncbi.nlm.nih.gov/pubmed/30385129
Cleft palate, renal agenesis	https://www.ncbi.nlm.nih.gov/pubmed/29995744
Septal heart defects	https://www.ncbi.nlm.nih.gov/pubmed/25450422
Cleft palate	http://www.motherisk.org/prof/updatesDetail.jsp?content_id=982

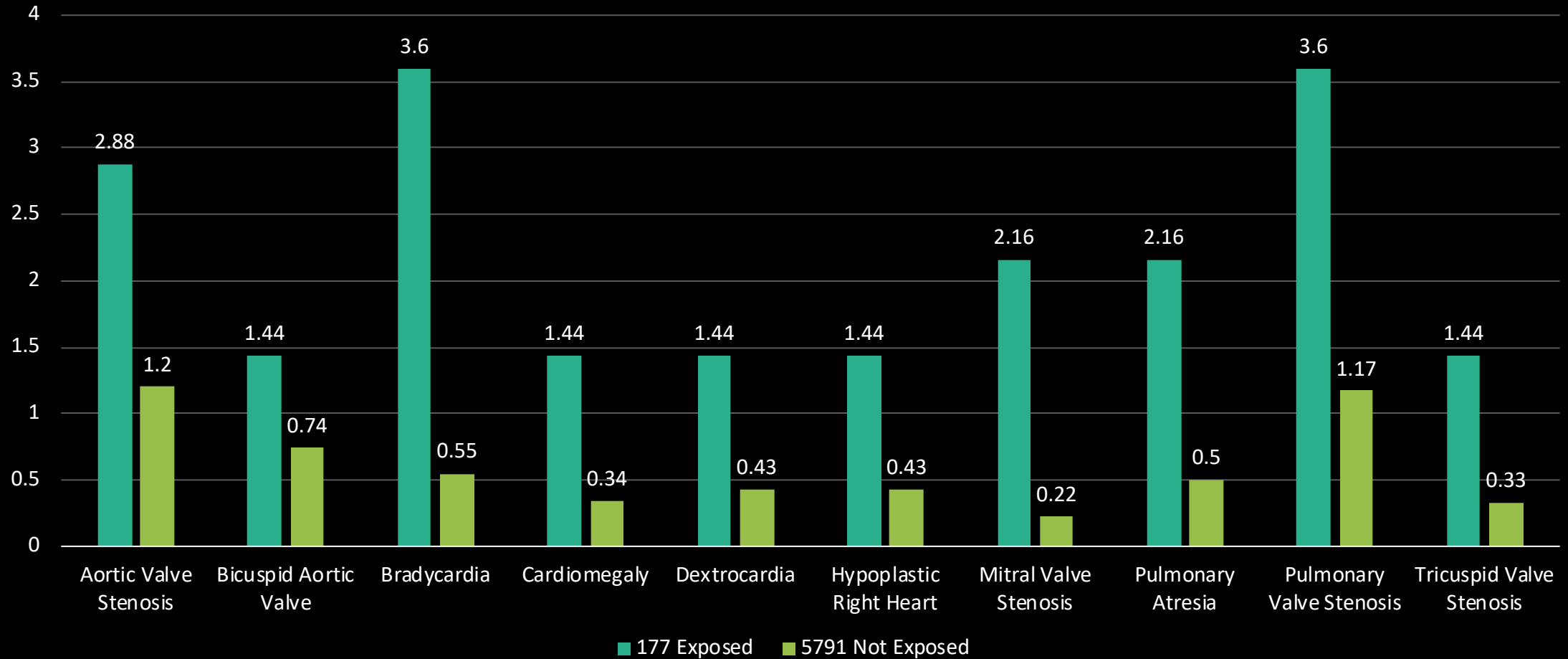
Results from the National Birth Defect Registry

Data from the National Birth Defect Registry compared birth defects in 177 Zofran-exposed cases to 5973 non-exposed cases.

Increases were found for **heart defects and high arched palate**. Significant increases were also found for **gastroschisis, NTDs and other birth defects** that have not been reported in published studies.

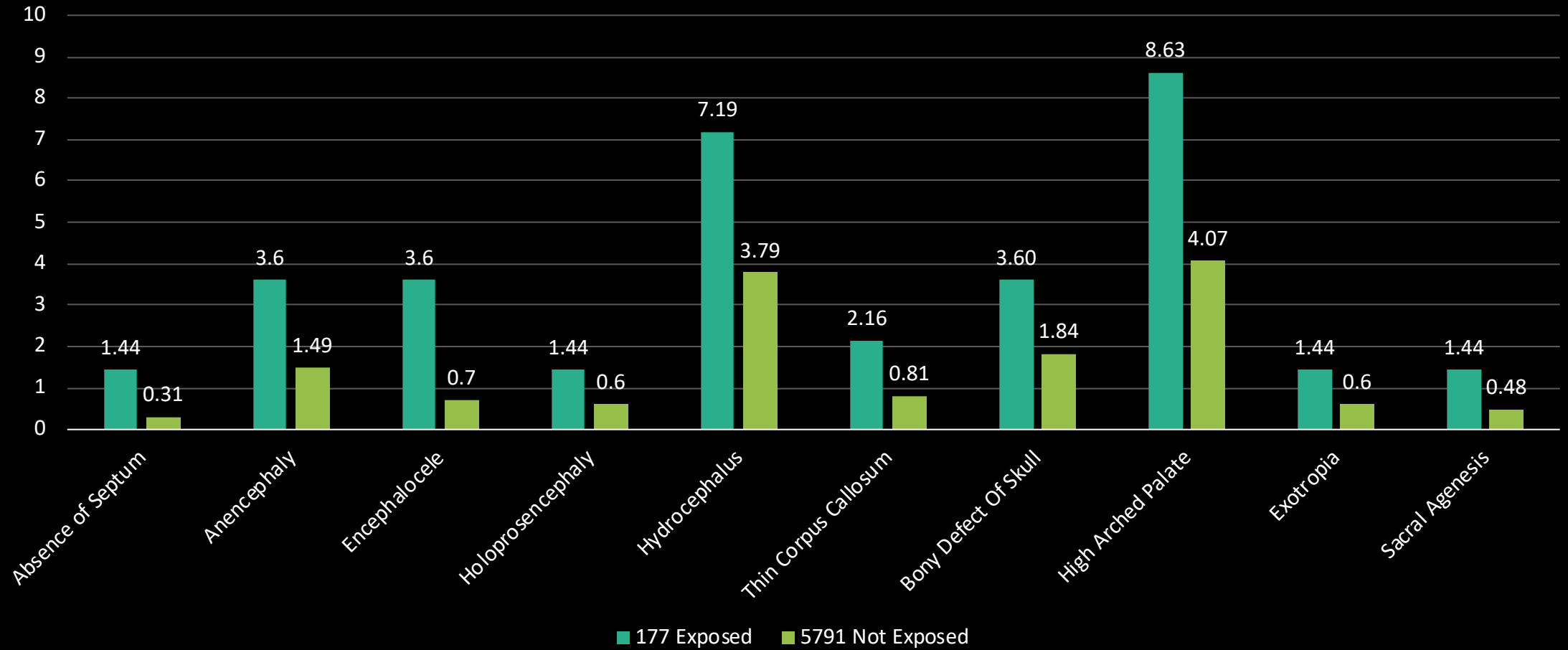
Zofran

Zofran and Heart Defects



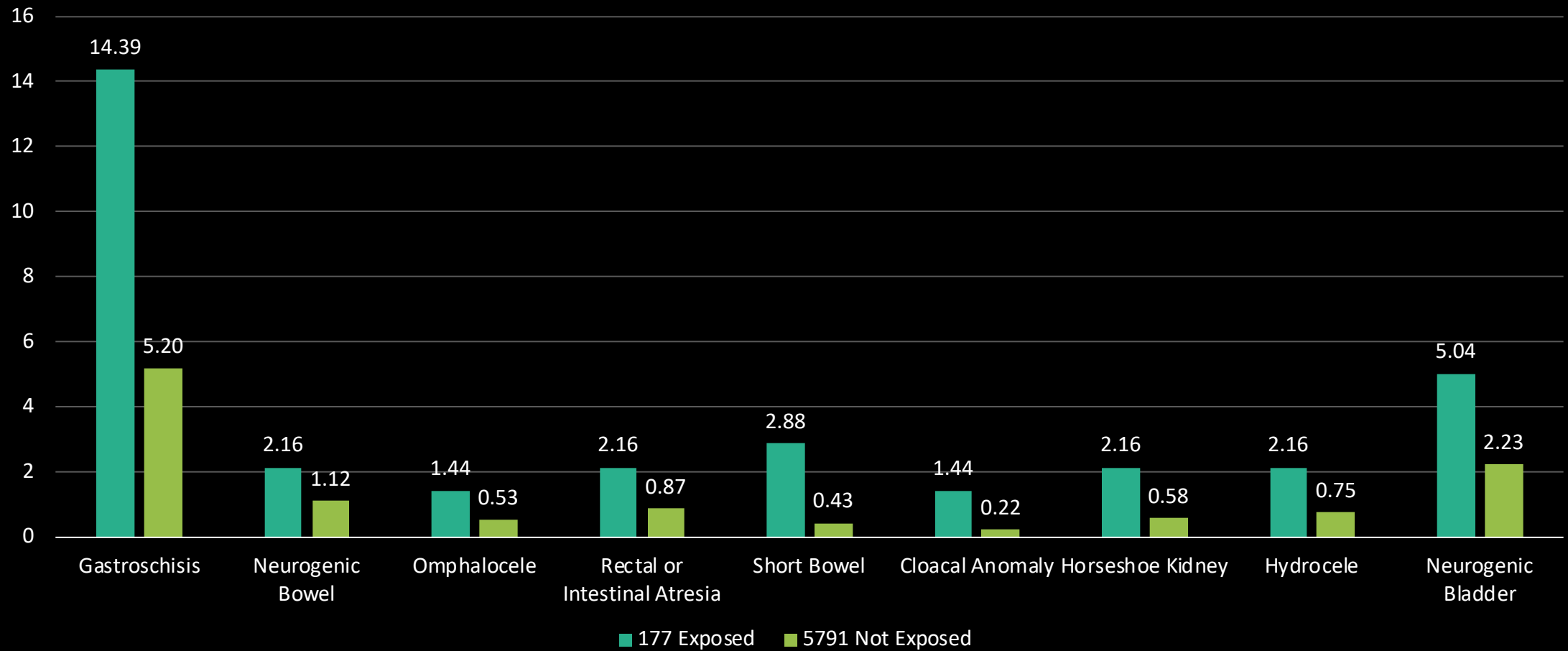
Zofran

CNS, Craniofacial, Eye & Spine



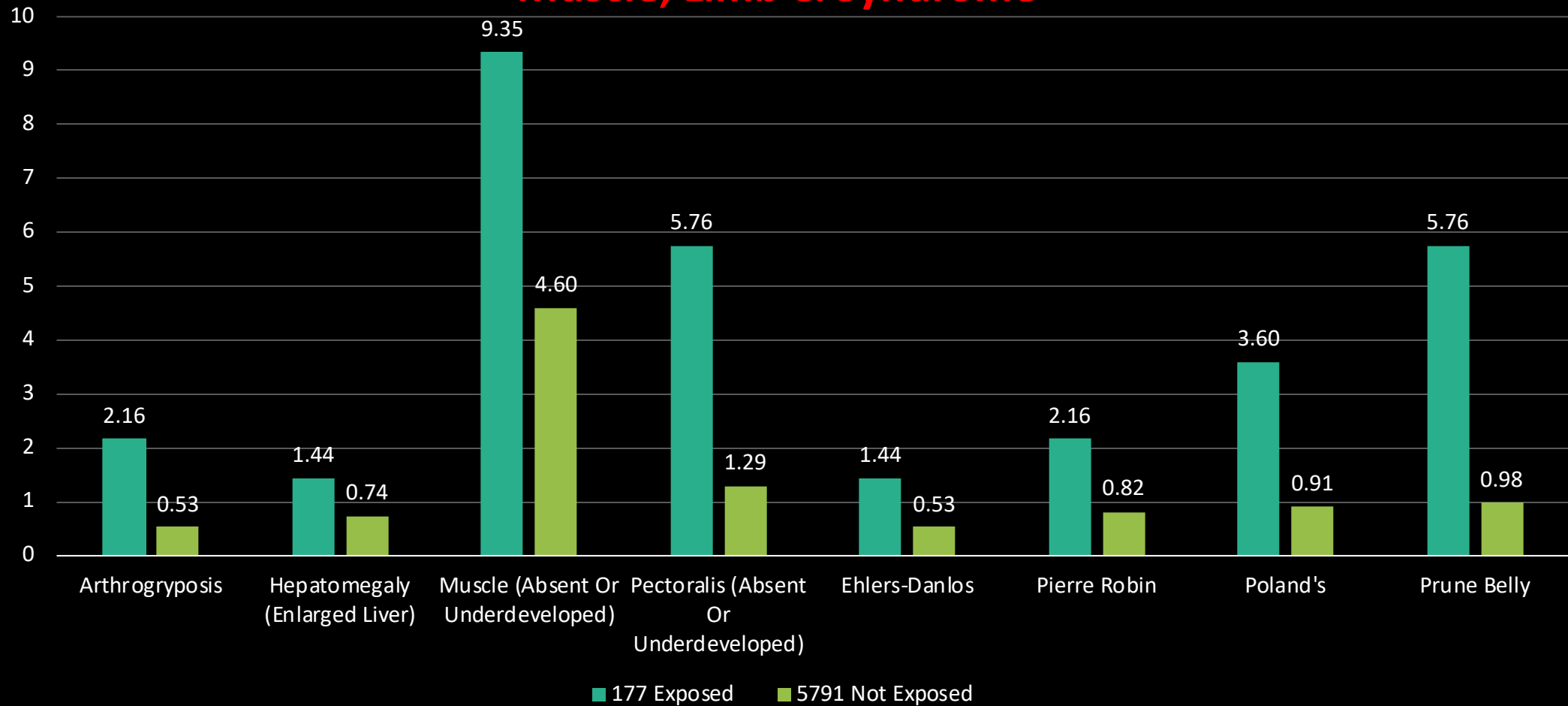
Zofran

Gastrointestinal & Genitourinary



Zofran

Muscle, Limb & Syndrome



Bendectin

Bendectin was an anti-nauseant medication, on the market from 1956-1982, recommended solely for morning sickness in pregnancy. The drug was a combination of an antihistamine (doxylamine succinate), an antispasmodic (dicyclomine hydrochloride) and vitamin B-6 (pyridoxine). In epidemiological studies, Bendectin was associated with increases in limb defects, heart defects, oral clefts, pyloric stenosis, amniotic band limb defects, encephalocele, diaphragmatic hernias and musculoskeletal defects. Bendectin was taken off the world-wide market in 1982.

CDC: Statistically significant association with amniotic band limb defects and encephalocele.

Heinonen: Data consistent for association of BDN with musculoskeletal defects.

Jick: Data consistent with modest teratogenic effect on limbs, BDN exposure increases risk of limb defect 120%

Michaelis: 36% increased risk of malformations in BDN exposed babies

Mitchell: 50% increased risk of limb defects in BDN exposed babies

Rothman: Statistically significant association with heart defects

Golding: Statistically significant association with oral clefts

Eskanaiz/Bracken: Statistically significant association with pyloric stenosis

Smithells: 36% increased risk of malformation in BDN exposed babies

Bass: 11-fold increase diaphragmatic hernia in BDN exposed babies

Maynard: Increase in diaphragmatic hernia in BDN exposed babies in analysis of 5 cohort studies

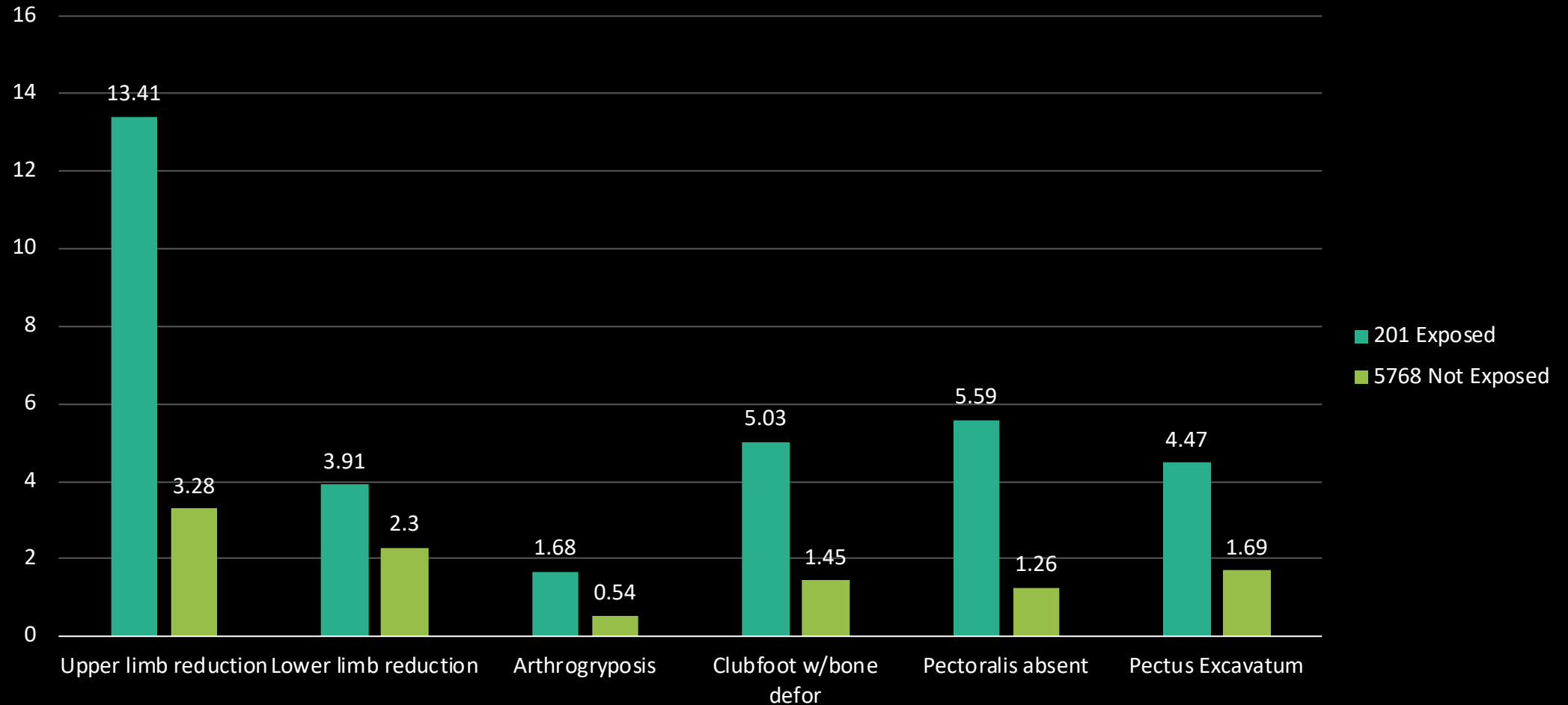
Results from the National Birth Defect Registry

Data from the National Birth Defect Registry compared birth defects in 201 Bendectin exposed cases to 5768 non-exposed cases.

Increases were found for **limb reduction defects, pyloric stenosis, muscle and skeletal defects, clubfoot with bone deformities and other birth defects.**

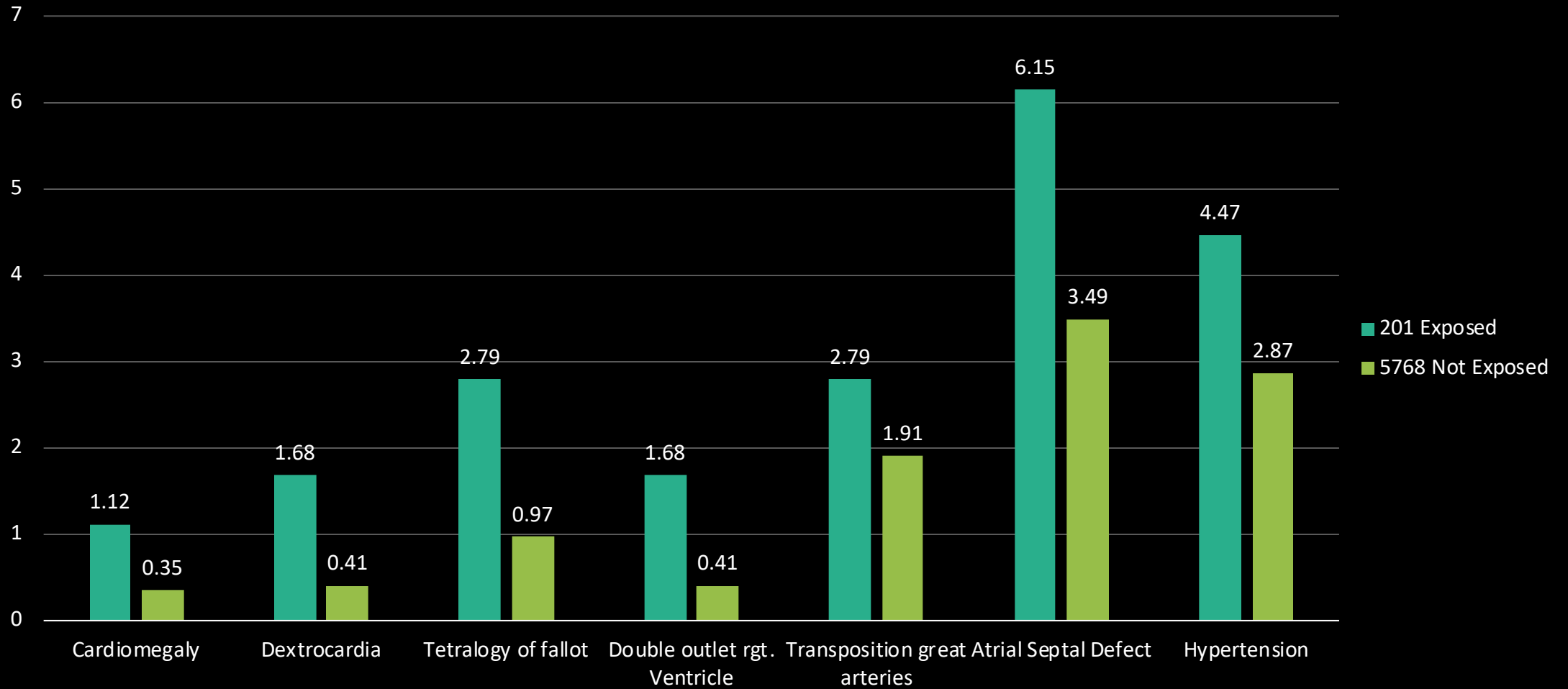
Bendectin

Limb, Chest and Muscle Deformities



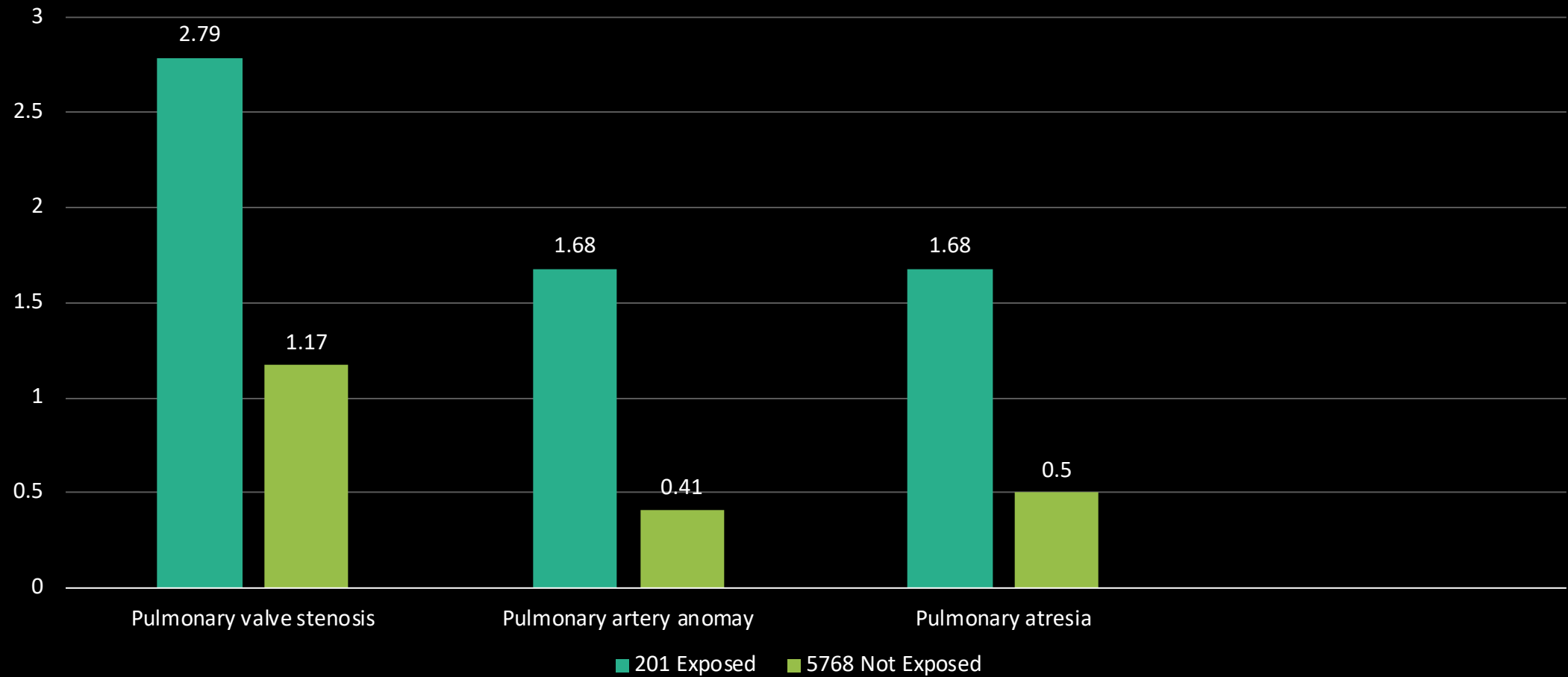
Bendectin

Heart (1)



Bendectin

Heart (2)



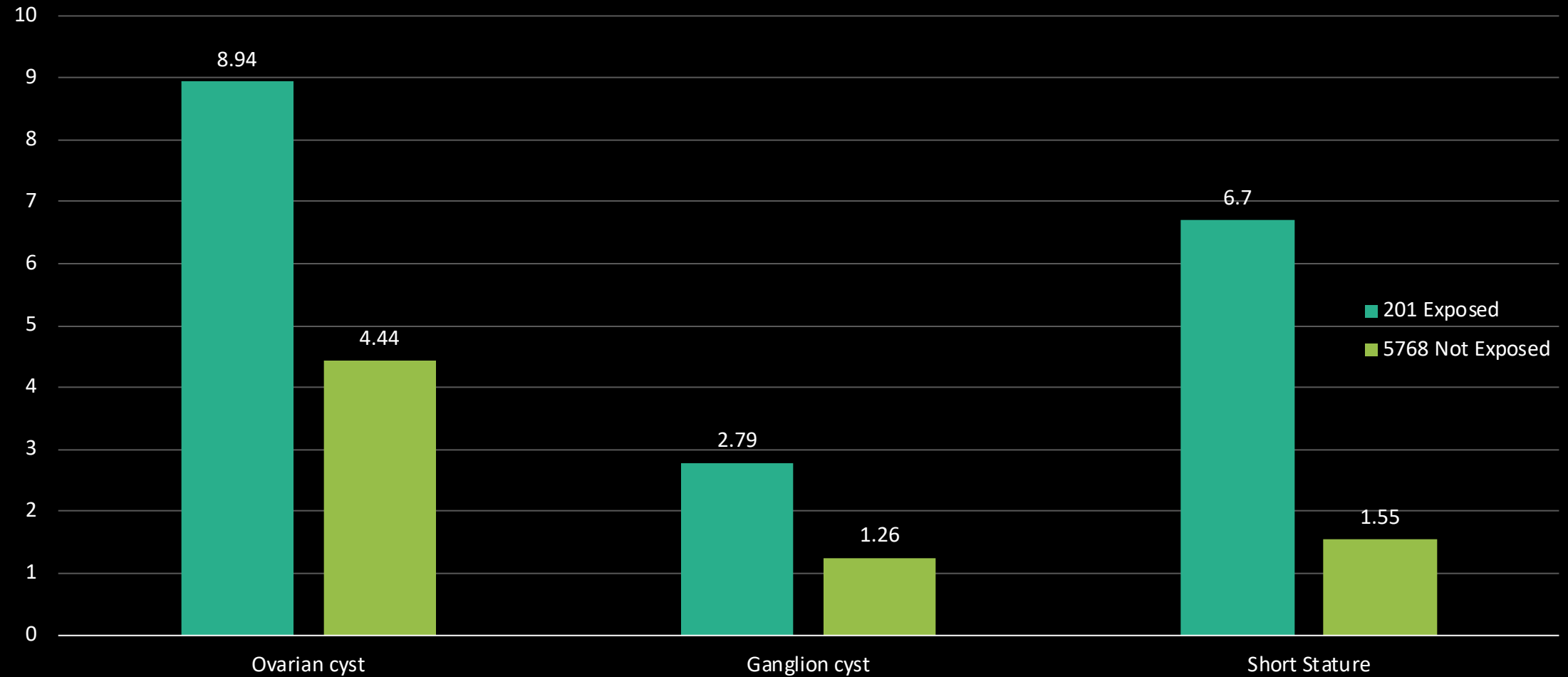
Bendectin

GI and Genitourinary



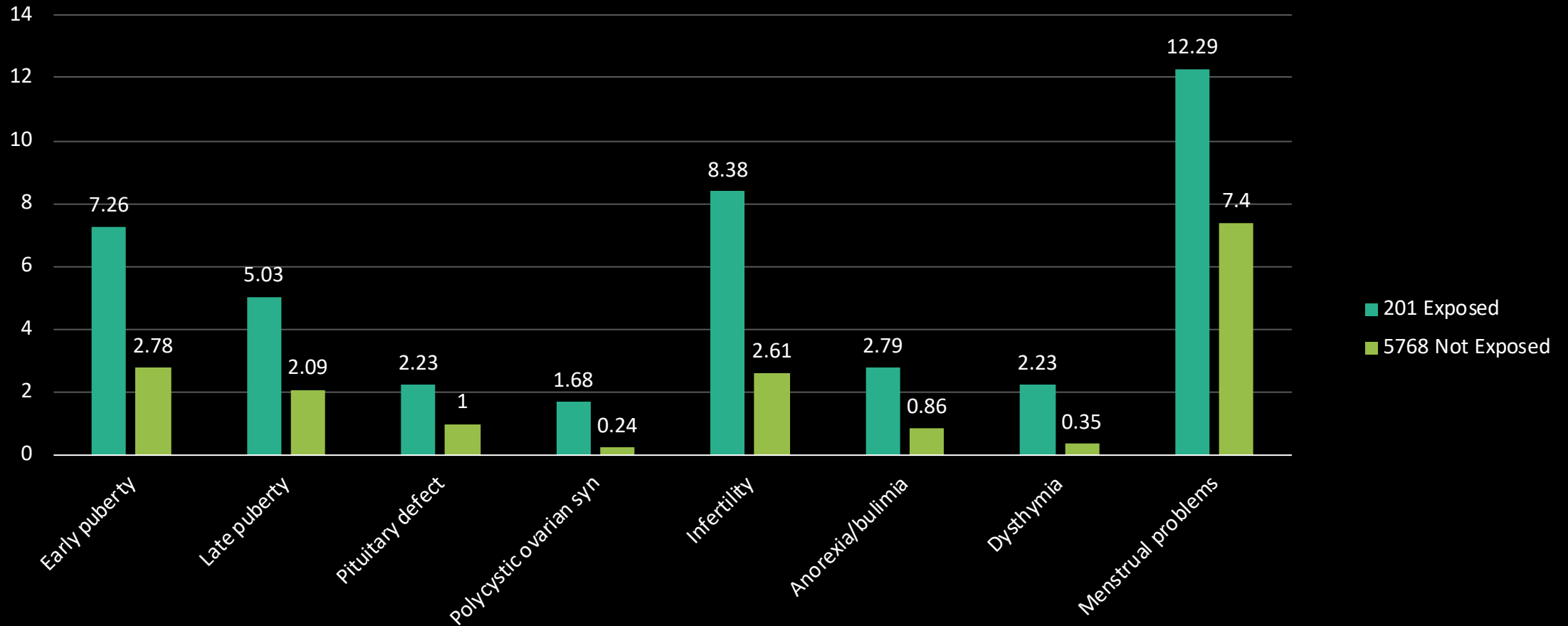
Bendectin

Cysts and Growth



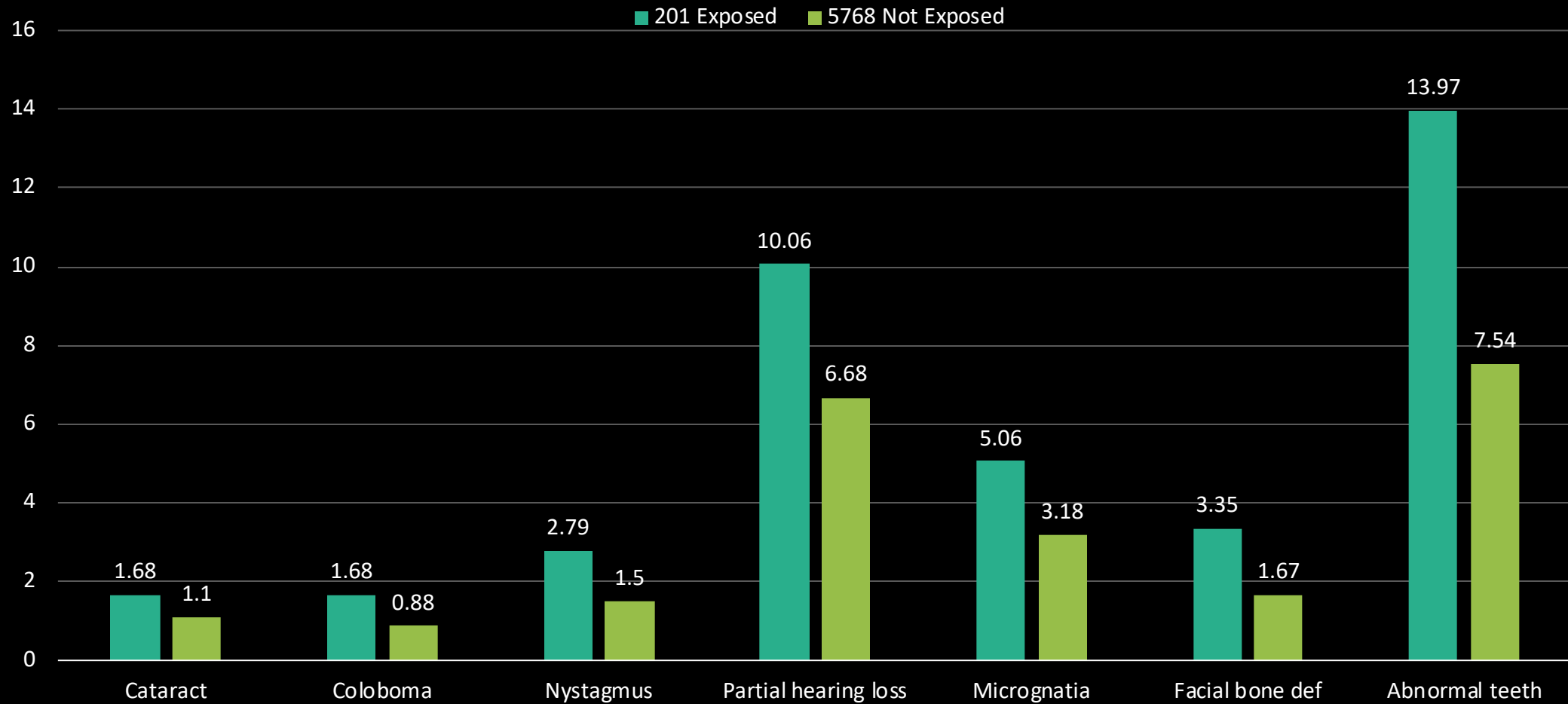
Bendectin

Endocrine and others



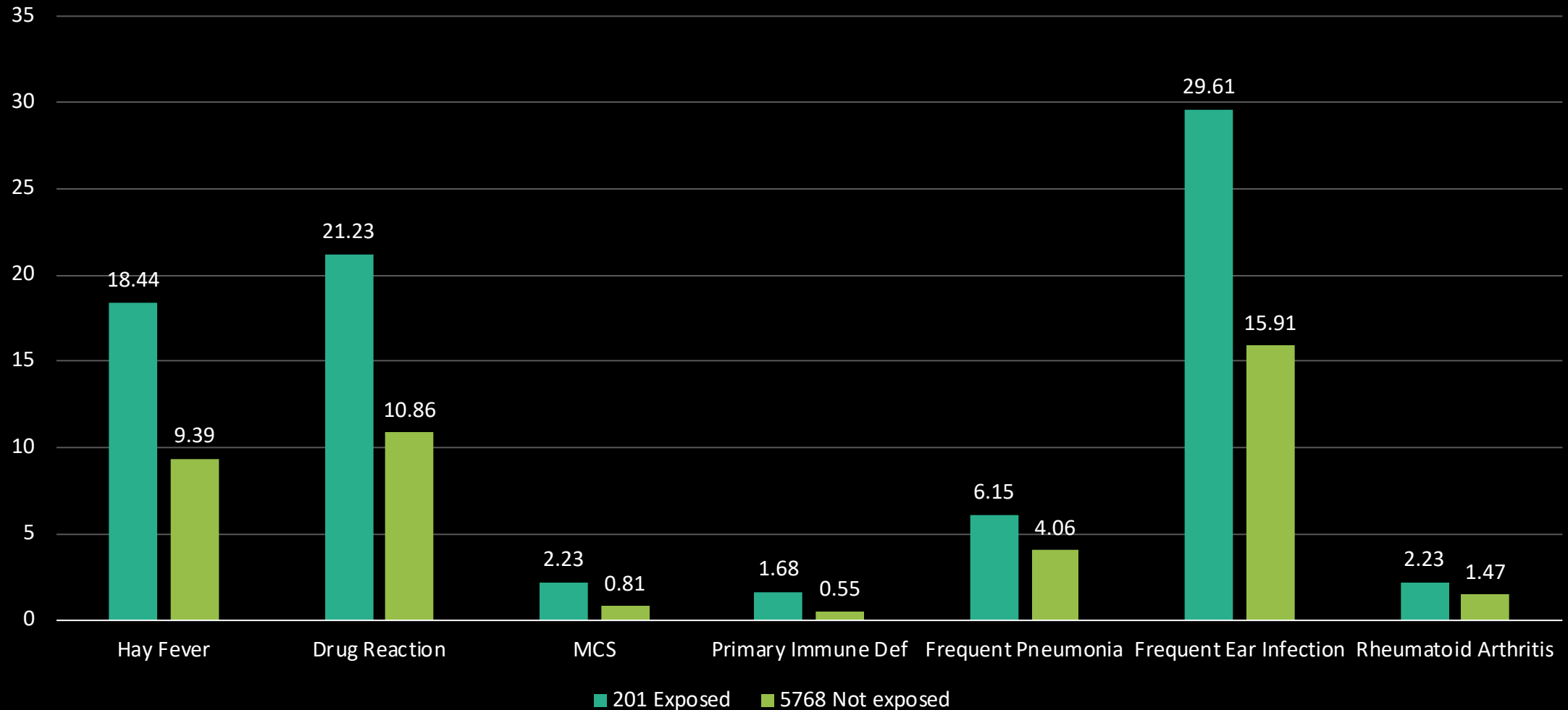
Bendectin

Eye, Ear, Facial



Bendectin

Immune Disorders



Nail Tech Exposures

Artificial nail technicians are exposed to a number of reproductive toxicants including the solvent toluene, plasticizers like Di-n-butyl phthalate (DBP), acetone and formaldehyde. Toluene has been associated with **intrauterine growth retardation, congenital malformations, intellectual disabilities** and premature delivery. DBP is believed to cause **reproductive toxicity** at high exposures over extended periods of time. Formaldehyde is suspected of **reproductive toxicity**. DBP and formaldehyde have been banned by the European Union.

Nail Tech Exposures	
Birth Defects	https://www.scientificamerican.com/article/these-4-chemicals-may-pose-the-most-risk-for-nail-salon-workers/
Harm to unborn child	https://www.osha.gov/SLTC/nailsalons/chemicalhazards.html
NTDs	https://www.jstor.org/stable/27797694?seq=1#page_scan_tab_contents/
Birth Defects	https://www.p65warnings.ca.gov/fact-sheets/di-n-butyl-phthalate-dbp/
Dev delays/neurobehavioral	https://www.ncbi.nlm.nih.gov/pubmed/20377315
Congenital malformation	https://www.ncbi.nlm.nih.gov/pubmed/11350197
Damage develop fetus	https://www.nj.gov/health/eoh/rtkweb/documents/fs/1866.pdf
Birth Defects	https://www.nj.gov/health/eoh/rtkweb/documents/fs/0773.pdf

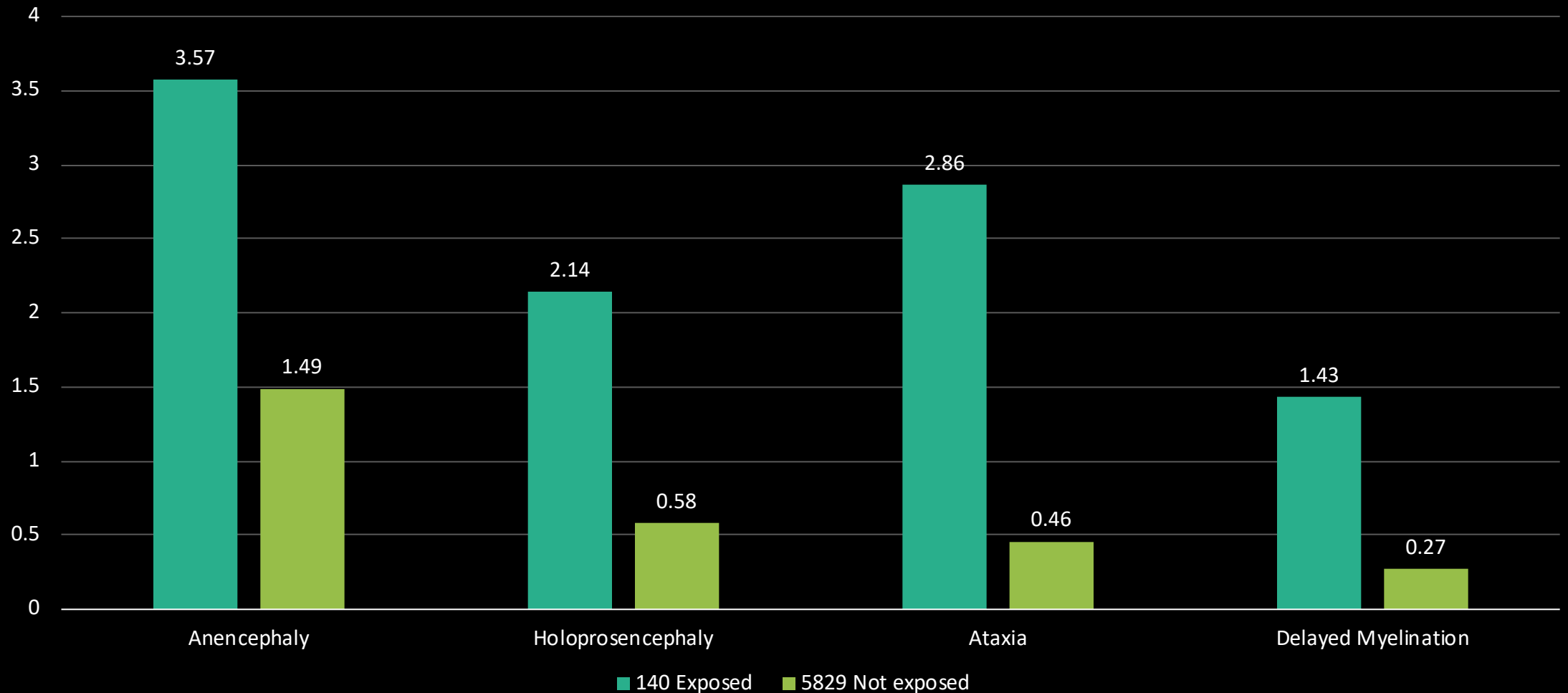
Results from the National Birth Defect Registry

Data from the National Birth Defect Registry compared birth defects in 140 nail-tech cases to 5829 non-exposed cases.

Increases were found for **anencephaly (NTD)**. Significant increases were also found for **gastroschisis, Autistic Spectrum Disorders and other birth defects** that have not been reported in published studies.

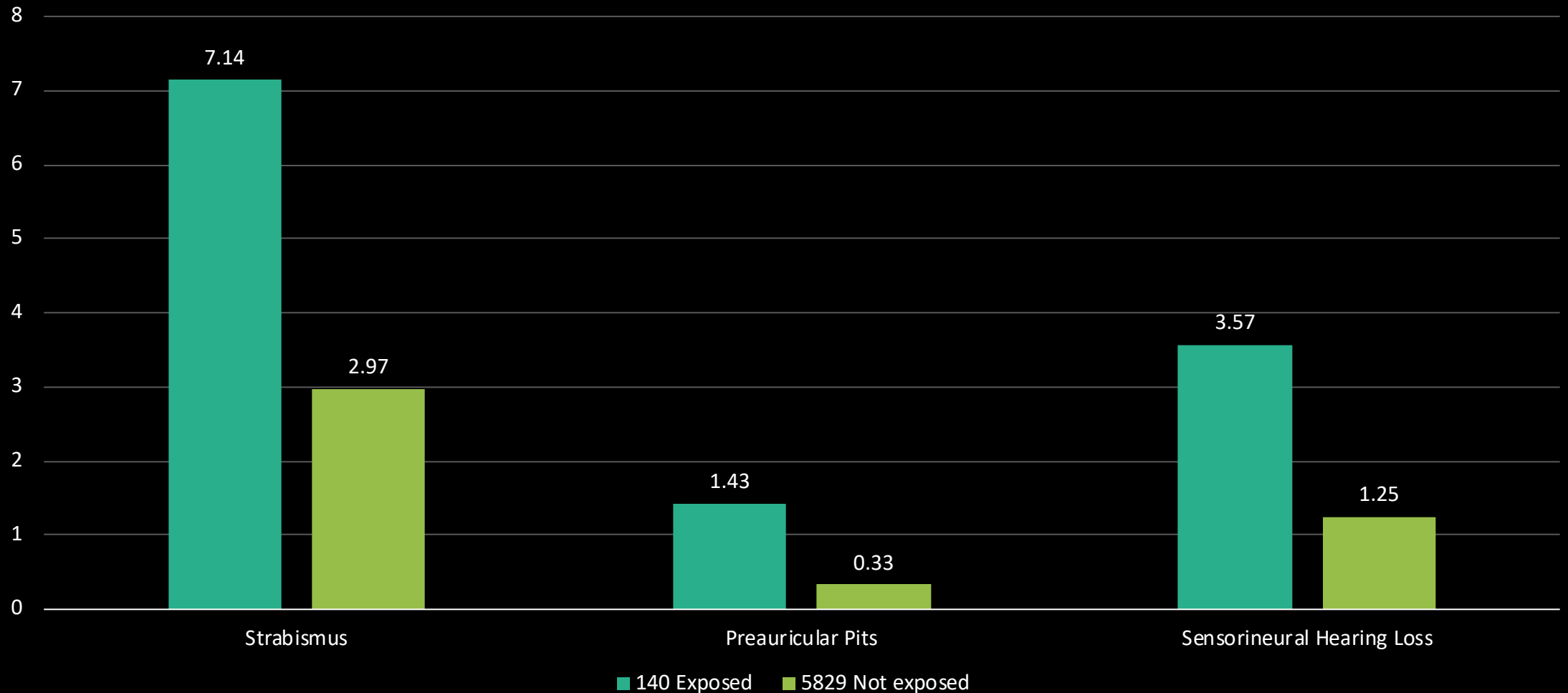
Artificial Nail Tech

Central Nervous System



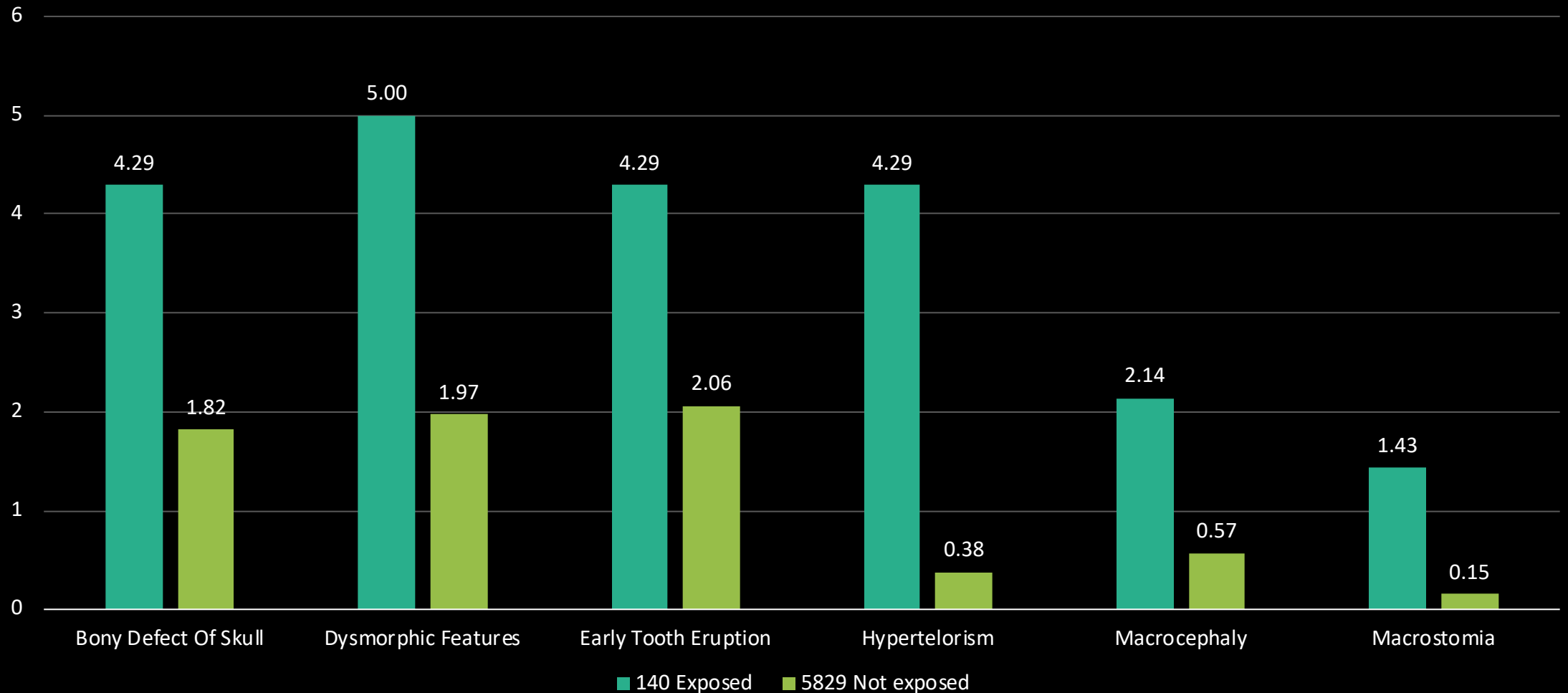
Artificial Nail Tech

Eye and Ear



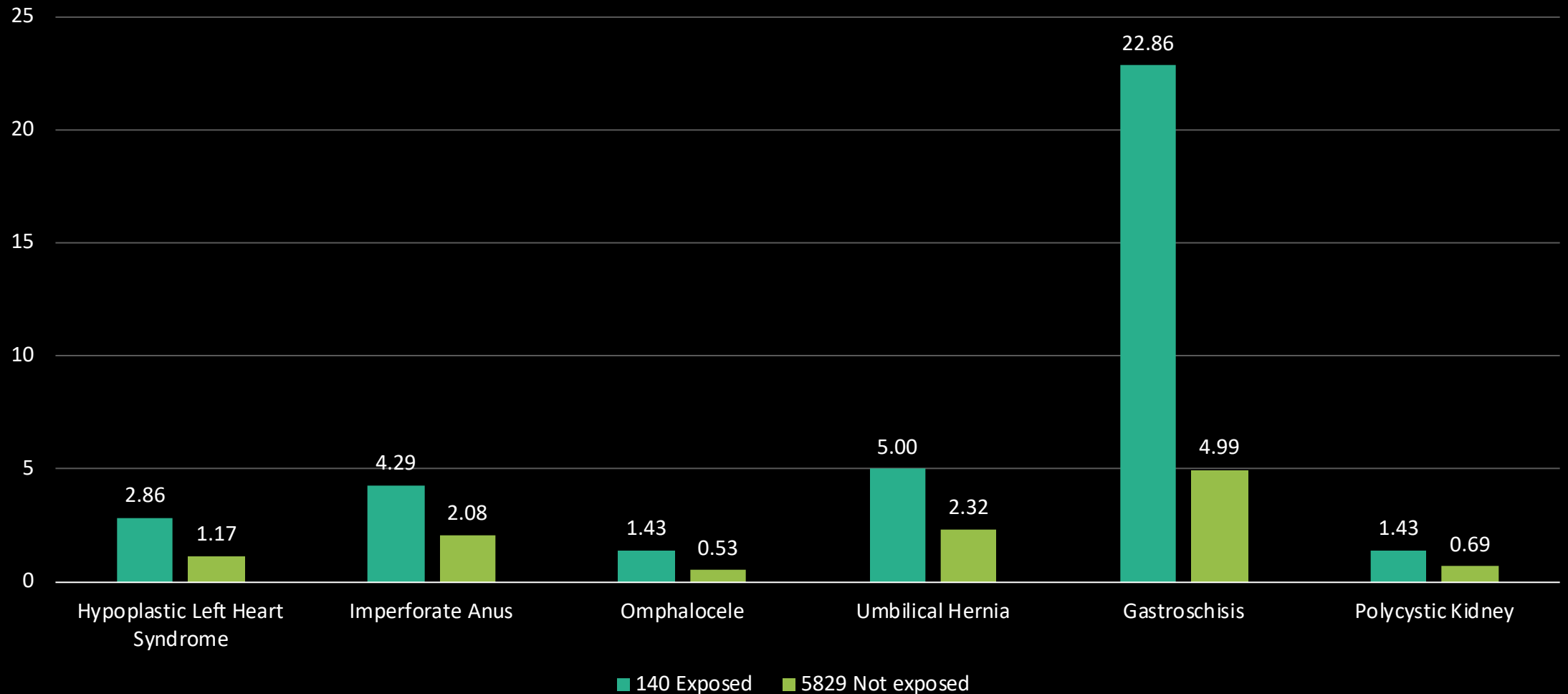
Artificial Nail Tech

Cranial/Facial



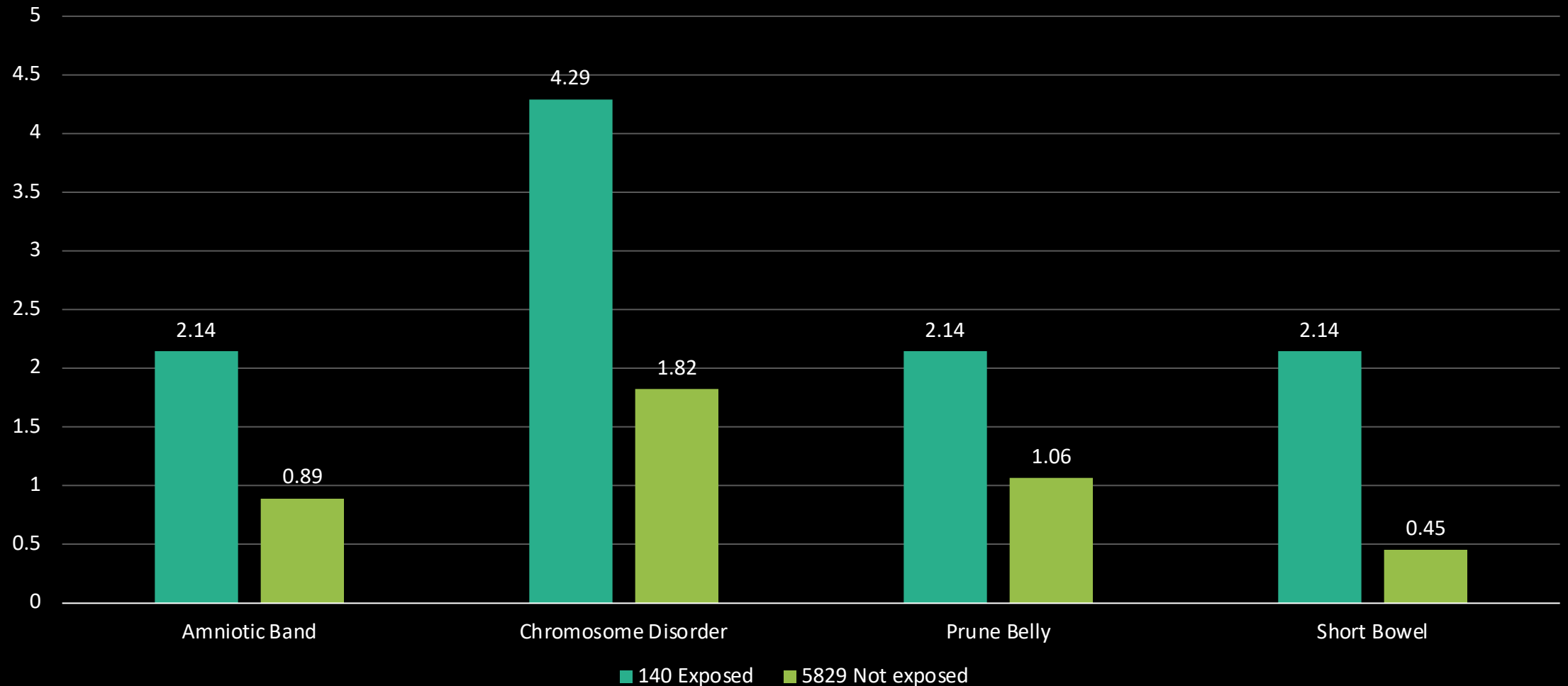
Artificial Nail Tech

Cardiovascular, Gastrointestinal, Genitourinary



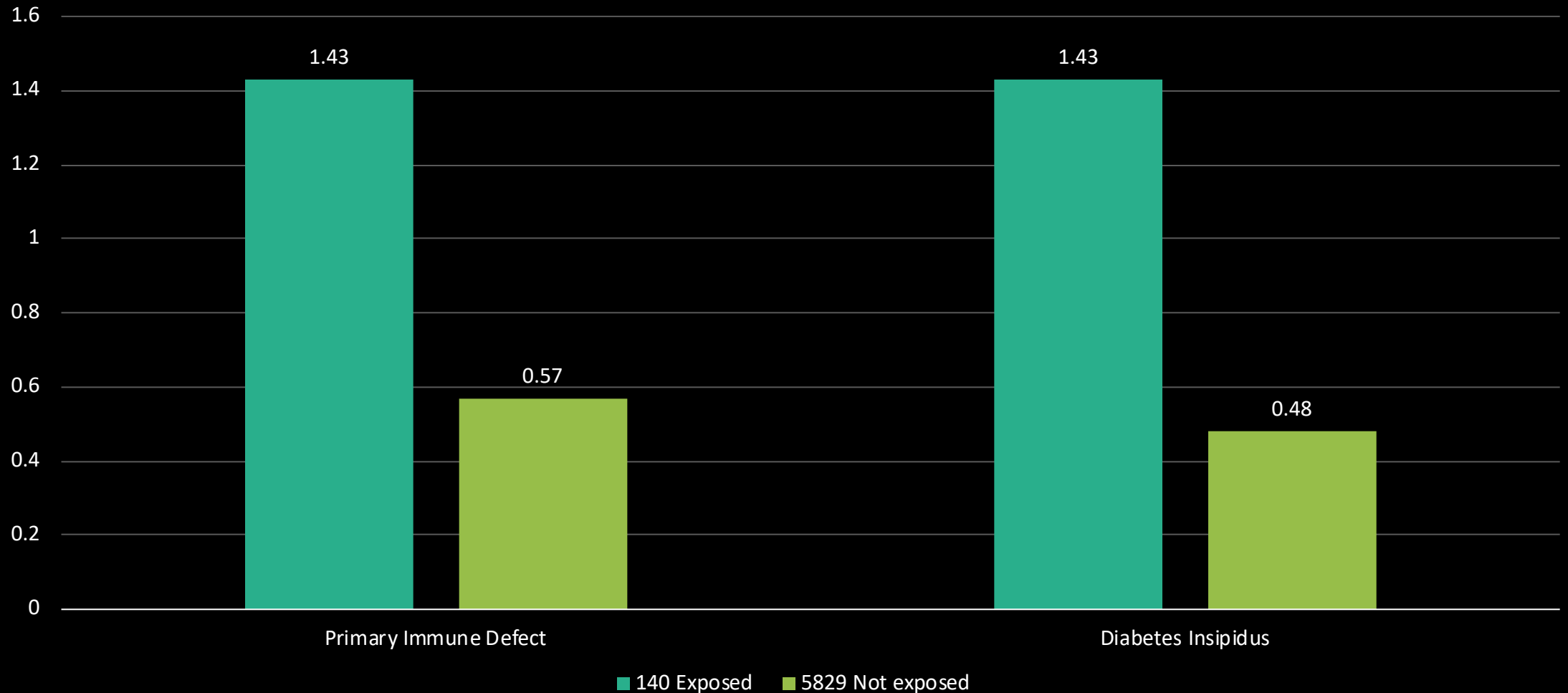
Artificial Nail Tech

Syndromes



Artificial Nail Tech

Immune and Endocrine



Artificial Nail Tech

Autism Spectrum Disorders

