## Shared and Unique 3D Genomic Features of Substance Use Disorders Across Multiple Cell Types

Khanh B. Trang<sup>1,2</sup>, Alessandra Chesi<sup>1,3</sup>, Sylvanus Toikumo<sup>4,5</sup>, James A. Pippin<sup>1,2</sup>, Matthew C. Pahl<sup>1,2</sup>, Joan M. O'Brien<sup>7,8</sup>, Laufey T. Amundadottir<sup>9</sup>, Kevin M. Brown<sup>9</sup>, Wenli Yang<sup>10,11</sup>, Jaclyn Welles<sup>10,12</sup>, Dominic Santoleri<sup>10,12</sup>, Paul M. Titchenell<sup>10,12</sup>, Patrick Seale<sup>10,11</sup>, Babette S. Zemel<sup>6,13</sup>, Yadav Wagley<sup>14</sup>, Kurt D. Hankenson<sup>14</sup>, Klaus H. Kaestner<sup>10,15</sup>, Stewart A. Anderson<sup>16,17</sup>, Matthew S. Kayser<sup>5,18,19</sup>, Andrew D. Wells<sup>1,3,20</sup>, Henry R. Kranzler<sup>4,5</sup>, Rachel L. Kember<sup>4,5</sup>, and Struan F.A. Grant<sup>1,2,10,15,21</sup>

<sup>1</sup>Center for Spatial and Functional Genomics, Children's Hospital of Philadelphia, Philadelphia, PA, USA

<sup>2</sup>Division of Human Genetics, Children's Hospital of Philadelphia, Philadelphia, PA, USA <sup>3</sup>Department of Pathology and Laboratory Medicine, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA, USA

<sup>4</sup>Mental Illness Research, Education and Clinical Center, Crescenz Veterans Affairs Medical Center, Philadelphia, PA, USA

<sup>5</sup>Department of Psychiatry, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA, USA

<sup>6</sup>Division of Gastroenterology, Hepatology, and Nutrition, Children's Hospital of Philadelphia, PA, USA

<sup>7</sup>Scheie Eye Institute, Department of Ophthalmology, Perelman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania, PA, USA

<sup>8</sup>Penn Medicine Center for Ophthalmic Genetics in Complex Disease, Perelman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania, PA, USA

<sup>9</sup>Laboratory of Translational Genomics, Division of Cancer Epidemiology and Genetics, National Cancer Institute, Bethesda, MD, USA

<sup>10</sup>Institute for Diabetes, Obesity and Metabolism, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA, USA

<sup>11</sup>Department of Cell and Developmental Biology, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA, USA

<sup>12</sup>Department of Physiology, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA, USA

<sup>13</sup>Department of Pediatrics, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA, USA

<sup>14</sup>Department of Orthopedic Surgery, University of Michigan Medical School Ann Arbor, MI, USA <sup>15</sup>Department of Genetics, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA, USA

<sup>16</sup>Department of Child and Adolescent Psychiatry, Children's Hospital of Philadelphia, Philadelphia, PA, USA

<sup>17</sup>Department of Psychiatry, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA, USA

<sup>18</sup>Department of Neuroscience, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA 19104, USA

<sup>19</sup>Chronobiology Sleep Institute, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA 19104, USA

<sup>20</sup>Institute for Immunology, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA 19104, USA