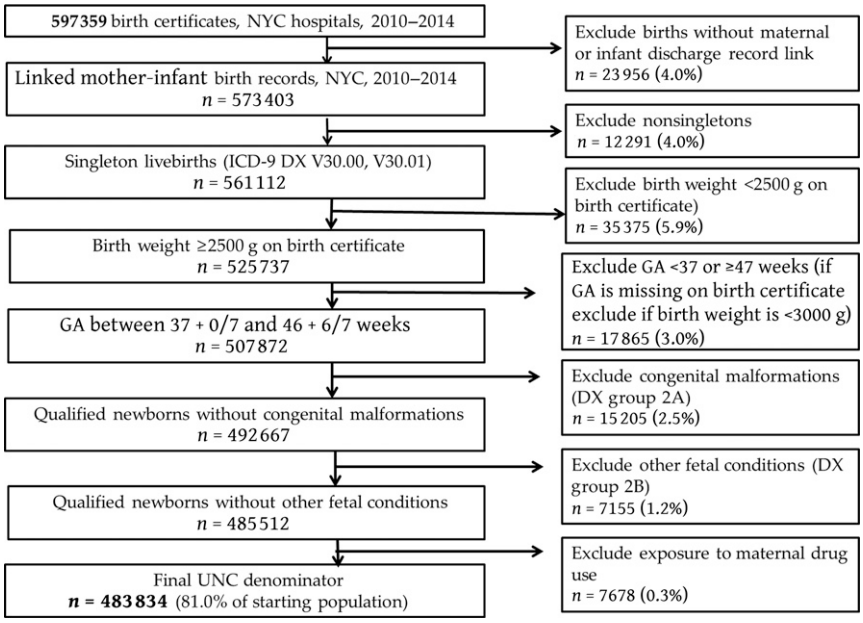
Supplemental Materials



SUPPLEMENTAL FIGURE 3
Study population flowchart. DX, diagnosis; GA, gestational age; UNC, unexpected neonatal complication.

SUPPLEMENTAL TABLE 4 Classification of Severe and Moderate Neonatal Morbidity According to ICD-9 Diagnosis and Procedure Codes

	Diagnosis Code	Procedure Code
Severe complications		
Severe neurologic and/or birth injury		—
Intraventricular hemorrhage unspecified grade	772.1	—
Intraventricular hemorrhage, grade I	772.11	—
Intraventricular hemorrhage, grade II	772.12	—
Intraventricular hemorrhage, grade III	772.13	—
Intraventricular hemorrhage, grade IV	772.14	—
Subarachnoid hemorrhage of fetus or newborn	772.2	—
Convulsions in newborn	779	—
Grand mal status	345.3	—
Cerebral depression, coma, and other abnormal cerebral signs in fetus or newborn	779.2	—
Periventricular leukomalacia	779.7	—
Cardiac arrest of newborn	779.85	—
Cardiac arrest	427.5	—
Encephalopathy, unspecified	348.3	—
Metabolic encephalopathy	348.31	—
Other encephalopathy	348.39	—
Cerebral edema	348.5	—
EEG	—	89.14
Gastrostomy	—	43.1
Subdural and cerebral hemorrhage	767	—
Epicranial subaponeurotic hemorrhage (massive)	767.11	—
Other injuries to skeleton due to birth trauma	767.3	—
Injury to spine and spinal cord due to birth trauma	767.4	—
Injury to brachial plexus due to birth trauma	767.6	—
Other cranial and peripheral nerve injuries due to birth trauma	767.7	—
Severe birth asphyxia	768.5	—
Mild or moderate birth asphyxia	768.6	—
Hypoxic-ischemic encephalopathy, unspecified	768.7	—
Mild hypoxic-ischemic encephalopathy	768.71	—
Moderate hypoxic-ischemic encephalopathy	768.72	—
Severe hypoxic-ischemic encephalopathy	768.73	—
Unspecified severity of birth asphyxia in liveborn infant	768.9	—
Congenital diplegia	343	—
Congenital hemiplegia	343.1	—
Congenital quadriplegia	343.2	—
Congenital monoplegia	343.3	—
Infantile hemiplegia	343.4	—
Other specified infantile cerebral palsy	343.8	—
Infantile cerebral palsy, unspecified	343.9	—
Severe shock and/or resuscitation		
Disseminated intravascular coagulation in newborn	777.5	—
Necrotizing enterocolitis in newborn, unspecified	777.51	—
Stage I necrotizing enterocolitis in newborn	777.52	—
Stage II necrotizing enterocolitis in newborn	777.53	—
Stage III necrotizing enterocolitis in newborn	785.5	—
Shock, unspecified	785.51	—
Cardiogenic shock	785.52	—
Septic shock	785.59	—
Other shock without mention of trauma	584.5	—
Acute kidney failure with lesion of tubular necrosis		—
Arterial catheterization	—	38.91
Cardiopulmonary resuscitation, not otherwise specified	—	99.6
Severe respiratory complications		
Persistent fetal circulation	747.83	—
Meconium aspiration with respiratory symptoms	770.12	—
Pulmonary hemorrhage	770.3	—
Continuous invasive mechanical ventilation of unspecified duration	—	96.7
Continuous invasive mechanical ventilation for $<$96 consecutive hours	—	96.71
Continuous invasive mechanical ventilation for $\geq$96 consecutive hours	—	96.72
Administration of inhaled nitric oxide	—	0.12
Insertion of intercostal catheter for drainage	—	34.04

SUPPLEMENTAL TABLE 4 Continued

	Diagnosis Code	Procedure Code
Severe infection		
Congenital pneumonia	770	—
Bacteremia of newborn	771.83	—
Severe sepsis	995.92	—
Septicemia (sepsis) of newborn[a]	771.81	—
Moderate Complications		
Moderate birth trauma/neurologic		
Fracture of clavicle due to birth trauma	767.2	—
Facial nerve injury due to birth trauma	767.5	—
The following codes additionally require an infant LOS >2 (vaginal birth) or >4 d (cesarean delivery) to validate severity:		
Breech delivery and extraction affecting fetus or newborn	763	—
Other malpresentation, malposition, and disproportion during labor and delivery affecting fetus or newborn	763.1	—
Forceps delivery affecting fetus or newborn	763.2	—
Delivery by vacuum extractor affecting fetus or newborn	763.3	—
Cesarean delivery affecting fetus or newborn	763.4	—
Maternal anesthesia and analgesia affecting fetus or newborn	763.5	—
Other specified brain trauma	767.9	—
Computerized axial tomography of head	—	87.03
Other tomography of head	—	87.04
MRI of brain and brainstem	—	88.91
Moderate respiratory complications		
Respiratory distress syndrome in newborn	769	—
Interstitial emphysema and related conditions	770.2	—
Noninvasive mechanical ventilation (eg, CPAP)	93.9	—
The following codes additionally require an infant LOS >2 (vaginal birth) or >4 d (cesarean delivery) to validate severity:	770.14	—
Aspiration of clear amniotic fluid with respiratory symptoms	770.14	—
Primary atelectasis	770.4	—
Other and unspecified atelectasis	770.5	—
Transitory tachypnea of newborn	770.6	—
Primary apnea of newborn	770.81	—
Other apnea of newborn	770.82	—
Cyanotic attacks of newborn	77.83	—
Respiratory failure of newborn	770.84	—
Aspiration of postnatal stomach contents with respiratory symptoms	770.86	—
Respiratory arrest of newborn	770.87	—
Hypoxemia of newborn	770.88	—
Other respiratory problems after birth	770.89	—
Intermittent positive pressure breathing	—	93.91
Nonmechanical methods of resuscitation	—	93.93
Respiratory medication administered by nebulizer	—	93.94
Hyperbaric oxygenation	—	93.95
Other oxygen enrichment	—	93.96
Other control of atmospheric pressure and composition	—	93.98
Other respiratory procedures	—	93.99
Moderate infection, septicemia of the newborn; this group includes infants with this code with a LOS ≤4 d	771.81	—
Long LOS, infant LOS >5, excluding cases with codes for jaundice (dx 773.1, 774, 774.1, 774.2, 774.3, 774.31, 774.39, 774.4, 774.5, 774.6, 774.7, px 93.83) or social reasons (dx V60.0, V60.1, V60.2, V60.3, V60.4, V60.6, V60.81, V60.89, V60.9, V61.05, V61.06) for prolonged LOS	—	—

CPAP, continuous positive airway pressure; dx, diagnosis; LOS, length of stay; px, procedure. —, not applicable.

[a] This code requires a minimum infant hospital length of stay of >4 d to ensure that it represents a serious diagnosis.

SUPPLEMENTAL TABLE 5 Distribution of Deliveries According to Race and Ethnicity and Unexpected Newborn Complication Rates Among 40 NYC Hospitals (Ranked by Tertile From Lowest to Highest Risk-Standardized Morbidity)

	Race and/or Ethnicity			
Tertile	White (n =158 117), n (%)	Black (n = 93 766), n (%)	Hispanic (n = 147 827), n (%)	Asian American (n = 82 582), n (%)
1	110 288 (69.8)	33 598 (35.8)	50 836 (34.4)	51 556 (62.4)
2	32 105 (20.3)	29 137 (31.1)	46 279 (31.3)	22 485 (27.2)
3	15 724 (9.9)	31 031 (33.1)	50 712 (34.3)	8541 (10.3)