Additional file 1

**Table S1.** The list of major rare diseases in Shanghai

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| **NO** | **CATEGORY** | **NAME OF DISEASE** |
| 1 | Kidney disease | Atypical hemolytic uremic syndrome |
| 2 | Endocrine and metabolic disease | Biotinidase deficiency |
| 3 | Endocrine and metabolic disease | citrullinemia |
| 4 | Endocrine and metabolic disease | Congenital adrenal hyperplasia |
| 5 | Endocrine and metabolic disease | Congenital hperinsulinemic hypoglycemia |
| 6 | Blood disease | Diamond-Blackfan anemia |
| 7 | Endocrine and metabolic disease | Fabry disease |
| 8 | Blood disease | Fanconi anemia |
| 9 | Endocrine and metabolic disease | Galactosemia |
| 10 | Endocrine and metabolic disease | Gaucher's disease |
| 11 | Endocrine and metabolic disease | Glutaric acidemia I |
| 12 | Endocrine and metabolic disease | Glycogen storage diseases |
| 13 | Blood disease | Hemophilia |
| 14 | Digestive disease | Hepatolenticular degeneration |
| 15 | Skin disease | Hereditary epidermolysis bullosa |
| 16 | Bone disease | Hypophosphatasia |
| 17 | Bone disease | Hypophosphatemic rickets |
| 18 | Cardiovascular disease | Idiopathic pulmonary arterial hypertension |
| 19 | Endocrine and metabolic disease | Laron syndrome |
| 20 | Endocrine and metabolic disease | Maple syrup urine disease |
| 21 | Endocrine and metabolic disease | Methylmalonic acidemia |
| 22 | Endocrine and metabolic disease | Mucopolysaccharidoses |
| 23 | Endocrine and metabolic disease | Niemann-Pick disease |
| 24 | Endocrine and metabolic disease | Noonan syndrome |
| 25 | Bone disease | Osteogenesis imperfecta |
| 26 | Endocrine and metabolic disease | Phenylketouria |
| 27 | Endocrine and metabolic disease | Prader-Willi syndrome |
| 28 | Endocrine and metabolic disease | Primary carnitine deficiency |
| 29 | Endocrine and metabolic disease | Propionic acidemia |
| 30 | Blood disease | Severe congenital neutropenia |
| 31 | Endocrine and metabolic disease | Silver-Russell syndrome |
| 32 | Endocrine and metabolic disease | Tyrosinemia |
| 33 | Immunological disease | Wiskott-Aldrich syndrome |
| 34 | Immunological disease | X-linked lymphoproliferative disease |

**Table S2.** Composition of direct medical cost

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Code**  | **Chinese name** | **English name**  | **Code**  | **Chinese name** | **English name**  |
| 00 | 挂号费 | Registration cost  | 08 | 摄片费 | Imaging cost |
| 01 | 住院费 | Hospitalization cost | 09 | 透视费 | * Fluoroscopy

cost |
| 02 | 诊疗费 | Diagnostic cost | 10 | 输血费 | Blood transfusion cost |
| 03 | 治疗费 | Treatment cost | 11 | 输氧费 | Supplementary Oxygen cost |
| 04 | 护理费 | Nursing services cost | 12 | 西药费 | Conventional medicine cost |
| 05 | 手术材料费 | Surgical materials cost | 13 | 中成药费 | Traditional Chinese medicine (pill form) cost  |
| 06 | 检查费 | Inspection cost | 14 | 中草药费 | Traditional Chinese medicine (herbal drink form) cost |
| 07 | 化验费 | Laboratory cost | 15 | 其他费用 | Other expenses |

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**Table S3.** Sample size and mean cost of 34 rare diseases in Shanghai, China

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| --- | --- | --- | --- | --- |
| **NO** | **NAME OF DISEASE** | **ICD10 CODE** | **SAMPLE SIZE****(Number of patients with cost information entered into the HIE system)** | **MEAN COST(**¥**)** |
| 1 | Atypical hemolytic uremic syndrome | D59.301 | 16 | 13486.63 |
| 2 | Biotinidase deficiency | D81.801 | NA | NA |
| 3 | Citrullinemia | E72.202 | NA  | NA |
| 4 | Congenital adrenal hyperplasia | E25.004 | 856 | 13343.55 |
| 5 | Congenital hperinsulinemic hypoglycemia | E16.103 | 3507 | 1454.37 |
| 6 | Diamond-Blackfan anemia | D61.001 | 36 | 10986.67 |
| 7 | Fabry disease | E75.205 | 55 | 1891.98 |
| 8 | Fanconi anemia | E72.002 | 60 | 16030.11 |
| 9 | Galactosemia | E74.201 | NA  | NA |
| 10 | Gaucher's disease | E75.201 | 158 | 1619.09 |
| 11 | Glutaric acidemia I | E72.302 | NA  | NA |
| 12 | Glycogen storage diseases | E74.000 | 363 | 1406.91 |
| 13 | Hemophilia | D66.x01/D66.x02/D67.x01/D68.101 | 1823 | 35692.67 |
| 14 | Hepatolenticular degeneration | E83.001 | 1532 | 6828.40 |
| 15 | Hereditary epidermolysis bullosa | Q81.900 | 174 | 5848.99 |
| 16 | Hypophosphatasia | E83.306 | NA  | NA |
| 17 | Hypophosphatemic rickets | E83.308 | NA  | NA |
| 18 | Idiopathic pulmonary arterial hypertension | I27.000 | 1078 | 16438.84 |
| 19 | Laron syndrome | E34.304 | NA  | NA |
| 20 | Maple syrup urine disease | E71.001 | 71 | 1469.71 |
| 21 | Methylmalonic acidemia | E71.102 | 92 | 23730.12 |
| 22 | Mucopolysaccharidoses | E76.000 | NA  | NA |
| 23 | Niemann-Pick disease | E75.203 | 34 | 20189.86 |
| 24 | Noonan syndrome | Q87.105 | NA  | NA |
| 25 | Osteogenesis imperfecta | Q78.000 | 152 | 6604.24 |
| 26 | Phenylketouria | E70.000 | 54 | 4373.73 |
| 27 | Prader-Willi syndrome | Q87.106 | 141 | 10732.92 |
| 28 | Primary carnitine deficiency | E71.302 | 15 | 21542.45 |
| 29 | Propionic acidemia | E71.101 | 22 | 12294.99 |
| 30 | Severe congenital neutropenia | D70.x00 | 5345 | 17640.65 |
| 31 | Silver-Russell syndrome | Q87.100 | NA  | NA |
| 32 | Tyrosinemia | P74.501 | NA  | NA |
| 33 | Wiskott-Aldrich syndrome | D82.000 | 20 | 51056.60 |
| 34 | X-linked lymphoproliferative disease | D82.301 | 10 | 16012.52 |

**Table S4.** Payment types and coverage options for medical treatment in Shanghai, China

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| --- | --- | --- | --- | --- |
| **Payment** | ***Chinese Name*** | **Coverage Type** | **Demographics** | **Additional info** |
| social security card | *shebaoka*社保卡 | Medical Insurance Coverage | People with Shanghai permanent residence (hukou) | This card is issued by the Shanghai municipal government to holders of Shanghai permanent residence (hukou). Medical cost exceeding the co-pay amount are covered by the insurance plan  |
| medicare card | *yibaoka*医保卡 | Medical Insurance Coverage | People with Shanghai residence permit  | This card is issued by the Shanghai municipal government to holders of Shanghai residence permit holder. Medical cost exceeding the co-pay amount are covered by the insurance plan |
| hospital link card | *yilianka*医联卡 | Self-funded  | Can be obtained by anyone | This card serves as a patient identifier and payment method after delivery of medical services. Upon registration in the hospital that is a member of the hospital link system a patients is issued this card which is tied to a medical record and a monetary amount pre-paid by the patient. The patient use the card to access individual health information, test results , etc. |
| hospital self-charge card | *zifeika*自费卡 | self-funded | Can be obtained by anyone | This is the most basic form. Upon registration in the hospital the patient is issued such card which is tied to a medical record and stored monetary value. |