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## Economic Burden of Community-Acquired Pneumonia Among Pediatric Patients (Aged 3 Months to < 19 Years) in the Philippines

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### ABSTRACT

**Objective:** 1) To determine the hospitalization, follow-up and total costs, and the economic burden of community-acquired pneumonia among pediatric patients aged 3 months to <19 years of age; 2) To compare the estimated cost of hospitalization to the pneumonia case rate payments of the Philippine Health Insurance Corporation (PhilHealth). **Methods:** Using the societal perspective, both healthcare and non-healthcare costs were estimated. This was done through two tertiary private hospitals in the Philippines. A base-case and sensitivity analyses were performed using 2012 as the reference year. The PhilHealth claims were the basis for the economic burden. **Results:** The estimated healthcare-related hospitalization cost for PCAP-C was PHP24,332 – 75,409 (US\$576 – 1,786). For PCAP-D, it was PHP77,460 – 121,301 (US\$1,834 – 2,872) without mechanical ventilation and PHP97,993 – 141,834 if mechanical ventilation was used. These amounts are markedly higher than the PhilHealth case rates of

PHP15,000 for PCAP C and PHP32,000 for PCAP D. The post-discharge cost was PHP1,175 – 1,531 for PCAP C and PHP1,275 for PCAP D. The total hospitalization cost were PHP 31,332 – 93,609 for PCAP C and PHP117,103 – 160,944 for PCAP D. The exact economic burden due to pneumonia among the pediatric population was not definitely ascertained due to lack of specific number of PhilHealth claims for this age group. **Conclusions:** There is a huge disparity between the PhilHealth case rates for PCAP C and PCAP D and the study results. Hence, the estimated economic burden of hospitalization for pneumonia would be markedly higher.

**Keywords:** community-acquired pneumonia, economic burden, Philippines, PhilHealth.

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In the Philippines, pneumonia is one of the leading causes of morbidity, especially among children < 5 years of age. In 2006, there were 670,231 cases of acute lower respiratory infection (ARI) and pneumonia (or 828.8 per 100,000 population) in the country, with 393,812 cases (59%) occurring in the age group of < 5 years [1]. In 2010, the total number of cases decreased to 381,123 (or 412.8 per 100,000), with 197,852 cases (52%) occurring in the age group of 1 to 4 years [2]. However, despite this decrease, pneumonia continued to be the leading cause of mortality among children in this age group in 2001 to 2010. In addition, in 2010, pneumonia was the leading cause of mortality among those in the age group of 5 to 14 years [3].

Approximations of the cost of treatment underscore the economic burden that pneumonia in the pediatric age group

places on society, especially in the health care community. Among the developing countries of Asia, it was reported that in 2001 and 2002, the estimated average cost of in-patient treatment for acute respiratory infection reached US\$155.30 [4,5].

In 2006, the aggregate claims payment for pneumonia in the Philippine Health Insurance Corporation (PhilHealth) for in-patients below 19 years of age amounted to PHP324.688 million (US\$6.327 million using the 2006 average conversion rate of Philippine peso [PHP] to US dollar [US\$]) [6,7]. In 2011, it ranked second in the top 20 conditions reimbursed by PhilHealth based on the total number of claims (included both medical and surgical cases for all ages) but ranked first in terms of the amount reimbursed. The total PhilHealth claims for pneumonia in 2011 amounted to PHP2.5 billion [8].

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Because of the huge economic impact of pneumonia, particularly on the age group cited above, this study was undertaken with general and specific objectives.

The *general objective* was to determine the economic burden of community-acquired pneumonia (CAP) among pediatric patients in the age group of 3 months to < 19 years, by using a societal perspective. The *specific objectives* were 1) to determine the cost of treating CAP, for a) hospitalization cost (health care cost and non-health care cost) and b) total cost (hospitalization + 1-week postdischarge costs); 2) to compare the cost of hospitalization to that of the PhilHealth case rate payments for pneumonia; and 3) to determine the economic burden of CAP (hospitalized cases) in the country using the estimated cost as derived in specific objective 1.

All of these specific objectives pertain to patients in the age group of 3 months to < 19 years. Moreover, since PhilHealth only reimburses claims for those hospitalized for pediatric community-acquired pneumonia (PCAP): PCAP C and PCAP D, corresponding to pneumonia moderate risk (CAP-MR) and pneumonia high risk (CAP-HR), respectively, this study was limited to only these patients.

## Methods

### Setting

The above objectives were determined by using an urban setting and a suburban area in the country. The study sites were two tertiary private hospitals, the first one in Manila, an urban area and the capital of the Philippines and the other in a suburban area approximately 30 km south of Manila.

### Inclusion Criteria

The study included patients in the age group of 3 months to < 19 years admitted from January 1, 2012, to December 31, 2012, to the above-mentioned tertiary hospitals with a diagnosis of PCAP C or D, which had been made on the basis of clinical signs and symptoms and diagnostic tests. The medical records of the patients who satisfied the inclusion criteria were reviewed, and cases that met the criteria were entered in the study database. Subsequently, these data were aggregated and analyzed.

### Design: Cost Analysis

The steps for the cost analysis followed the methodology of a study on the economic burden of CAP among the adult population in the Philippines, using a societal perspective [9]. As an overview, the process involved calculation of the hospitalization and postdischarge or follow-up costs. Hospitalization costs included 1) the out-of-pocket expenses incurred as a direct result of the patient's hospitalization, 2) production or productivity losses, and 3) costs resulting from the consumption of other resources. However, there was a need to stratify the pediatric population into several groups to minimize variability in their inherent characteristics. In addition, stratification was needed for the calculation of the average cost of treatment for a particular age group. Unlike in the adult population, where the doses of antibiotics are relatively fixed (except in the presence of some modifying factors or comorbidities, such as renal diseases), in the pediatric population, the antibiotic dosage and the daily volume of the intravenous fluids infused are dependent on the patient's weight. The study population were thus grouped as follows: a) infants—> 3 months to < 2 years of age; b) children—> 2 years but < 11 years of age; and c) adolescents 11 to 18 years of age.

The 2012 Philippine Academy of Pediatric Pulmonologists Update for the evaluation and management of Pediatric

Community-Acquired Pneumonia [10] as well as standard practice patterns served as the bases for the costing of the diagnostic procedures and treatment options. These practice patterns were obtained through key informant interviews of experts, such as pediatricians and pediatric pulmonologists.

As in the study on the economic burden of pneumonia in adults [9], hospital charges for the diagnostic procedures, room and board, oxygenation, and other charges of the study sites were used in this study as well. Moreover, information about the cost of medications and other related expenses (costs of intravenous fluids, nasal prongs, and other related materials, such as cotton balls, alcohol, etc.) was obtained from the country's biggest drugstore chain to reduce variability in the charges among the study sites [9] and to increase the applicability of study results.

### Sensitivity Analysis: Best-Case and Worst-Case Scenarios

Approaches to undertaking sensitivity analysis include the use of “scenario analysis,” a form of multiway analysis, whereby the best-case and worst-case scenarios, that is, the most optimistic and the most pessimistic scenarios, respectively, are determined [11]. This type of sensitivity analysis was performed in this study.

The best-case scenario pertained to the use of the lowest costs of the range of the values of the included cost centers. This meant the use of the cost of the available generic counterpart of a particular antibiotic and the lowest charges for the diagnostic option, accommodation (ward), professional fees, and all other charges related to the hospitalization and follow-up costs. However, the policy of one of the study sites with regard to not placing patients with pneumonia in the general ward or allowing sharing of the room with other patients was taken into account. Hence, the lowest cost for a private room, rather than the charge for being confined in the wards, was the one included as the lowest cost for the room or accommodation. Moreover, for consistency purposes in costing, this policy was also applied to the other study site.

However, the PhilHealth case rate fees were designated as the lowest of the range of the professional fees. These corresponded to PHP15,000 for PCAP C (CAP-MR) and PHP32,000 for PCAP D (CAP-HR), which are equivalent to US\$356 and US\$758 for PCAP C and PCAP D, respectively, based on the average PHP to USD exchange rate for 2012 [12].

The worst-case scenario depicted the expensive scenario—that is, it entailed the use of the higher or highest cost possible in the study settings. In contrast to the best-case scenario, this scenario used the cost of innovator brands and the highest hospital charges for diagnostic or therapeutic interventions (e.g., oxygenation), accommodations (big private room instead of small private room), and other related expenses. In addition, instead of just using the average or mean, the SD (if applicable) was added to the average of the parameter measured (e.g., average weight plus SD or mean duration of hospitalization). For example, instead of using the PhilHealth case rate payment for professional fees, the room rates multiplied by the average number of hospitalization days plus its SD served as the basis for determining professional fees (this represents the highest in the range for the professional fees).

In view of the high variability in the use of antibiotics, data regarding antibiotic regimens obtained from practice guidelines and practice patterns were utilized. The antibiotics included intravenous penicillin G, ampicillin, cefuroxime, and ceftriaxone. After a certain number of days (3 days), a shift was made from intravenous antibiotics to oral preparations, usually amoxicillin or cefixime. Azithromycin or clarithromycin were also considered as add-on antibiotics. The costs of the antibiotic regimens were computed on the basis of the average weight (plus SD, if applicable) of a particular age group (infants, children, or

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