Success Story

Temperature Reduction in Pharmaceutical Storage Areas in Madre de Dios (Peru), Using Low-Cost Technology

Refurbishment of the pharmacies in 10 primary health care facilities using low-cost technology led to a reduction in temperatures inside the pharmacies compared with temperatures in other areas of the facilities and outside the facilities.

Background

The region of Madre de Dios, in southeastern Peru, is home to some 124,404 people (Instituto Nacional de Estadística e Informática, 2011). Its humid, tropical climate causes temperatures to reach levels as high as 36.8°C at various times during the year, with heavy rainfalls occurring between December and March. This region of Peru exhibits the country's highest rate of tuberculosis incidence.

The Regional Health Directorate (Dirección Regional de Salud; DIRESA) for Madre de Dios oversees a network of 111 health facilities, all of which include a pharmacy area where pharmaceuticals and medical supplies received from DIRESA are stored. The typical infrastructure for these pharmacies includes small unventilated areas, walls made of wood or concrete (in recently remodeled pharmacies), corrugated tin (zinc) roofs, wooden ceilings, and cement or wooden floors. As a result of these conditions, commodities stored in the pharmacies are exposed to high temperatures for long periods of time. Although recognized by regional authorities, this problem has yet to be addressed.

Intervention

Acting within the framework of the South American Infectious Disease Initiative (SAIDI), the Systems for Improved Access to Pharmaceuticals and Services Program proposed that a test be conducted to determine the benefits of using low-cost technology to reduce temperatures inside the region's pharmacies to recommended levels (i.e., lower than 30°C). The ensuing intervention was designed to prevent the transmission (whether by conduction or radiation) of the heat produced by sunlight falling on facility roofs and walls, as well as to improve the internal flow of air.

The intervention took place during April and May 2012 in 10 health facilities whose storage conditions were similar to those found throughout the region. The actions taken to reduce temperatures in the pharmacies included relocating the pharmacies to areas within the facilities where temperatures were lower, installing heat-insulating material on the underside of the corrugated tin roofs, installing exterior cornices or eaves on roofs to reduce sunlight falling on facility walls, supplying fans, and making adjustments to doors and windows to improve air flow. In addition, other interventions were implemented to improve storage conditions, such as supplying pallets, metal shelving, thermal hygrometers, and ladders, and installing security grilles over windows. The average investment per pharmacy benefiting from these temperature-reducing interventions was USD 498.

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Results

To determine the impact of the intervention and ascertain that the results were truly an outcome of the intervention and not caused by one or more environmental conditions existing at the time, temperature differentials were recorded for pharmacy compared with the facility and for the pharmacy compared with outdoors, both preintervention (April 2012) and postintervention (September 2012). The difference (gradient) should not depend on the time of year or on environmental conditions prevailing at the time temperatures were measured.

As can be seen in the following table, the facilities that received refurbishment in the form of thermal ceiling insulation complemented by other interventions designed to reduce heat transmission (5/10) were successful in reducing their temperature differentials by between 1.2 and 3.9°C, with an average reduction of 2.28°C. Of these five facilities, three recorded temperature levels below 30°C, the maximum allowable for pharmaceutical storage. The other facilities were unsuccessful in their efforts to improve temperature differentials. The evaluation conducted of the Jorge Chávez health center was excluded, because in that facility repairs were made to an existing air-conditioning unit, an intervention not deemed to fall within the definition of low-cost technology.

Health facility	Temperature-reducing interventions	Total cost (USD)	Difference in °C pharmacy/ facility before intervention	Difference in °C pharmacy/ facility after intervention	Reduction in temperature attributable to the intervention (°C)
Laberinto H.C.	Yes	615	Phar. 26.3 – Fac. 24.4 = 1.9	Phar. 31.7 – Fac. 33.7 = −2	3.9
Santa Rosa H.P.	Yes	277	Phar. 30.1 – Fac. 29 = 1.1	Phar. 24.5 – Fac. 24.6 = −0.1	1.2
Primavera Baja H.P.	Yes	510	Phar. 24.3 – Fac. 24.2 = 0.1	Phar. 31.6 – Fac. 32.7 = −1.1	1.2
Boca Colorado H.C.	Yes	447	Phar. 31.1 – Fac. 29 = 2.1	Phar. 29 – Fac. 30.70 = −1.7	3.8
Bajo Puquiri H.P.	Yes	643	Phar. 24.6 – Fac. 24.1 = 0.5	Phar. 25.8 – Fac. 26.6 = −0.8	1.3
Average for temperature-reducing interventions		**498**	**1.1**	**−1.1**	**2.3**
Mazuko H.C.	No	142	Phar. 30.4 – Fac. 29.9 = 0.5	Phar. 25.2 – Fac. 24.4 = 0.8	−0.3
Alto Libertad H.P.	No	456	Phar. 27.8 – Fac. 29.7 = −1.9	Phar. 31.3 – Fac. 31.8 = −0.5	−1.4
Huepetue H.C.	No	38	Phar. 27.4 – Fac. 28.5 = −1.1	Phar. 29 – Fac. 30.8 = −1.8	0.7
Nuevo Milenio H.C.	No	107	Phar. 26.3 – Fac. 30.6 = −4.3	Phar. 28.1 – Fac. 30.8 = −2.7	−1.7
Jorge Chávez H.C.	No	69	Phar. 29.2 – Fac. 29.2 = 0	Phar. 22.8 – Fac. 33.4 = −10.6	10.5
Average without temperature-reducing interventions		**186**	**−1.7**	**−1.05**	**−0.675**

Note: H.C. = health center; H.P. = health post; Phar. = pharmacy; Fac. = facility; USD = U.S. dollars.

Conclusion

The data provide evidence that the introduction of this low-cost technology can be credited with bringing about reductions of up to 3.9°C in the temperature inside the pharmacy with respect to other areas of the facility. The benefits of this technology can be extended to other facilities in the region exhibiting similar characteristics, thus enabling these additional facilities to store pharmaceuticals under acceptable conditions of temperature.

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