



Preventing vaccine freezing during transport

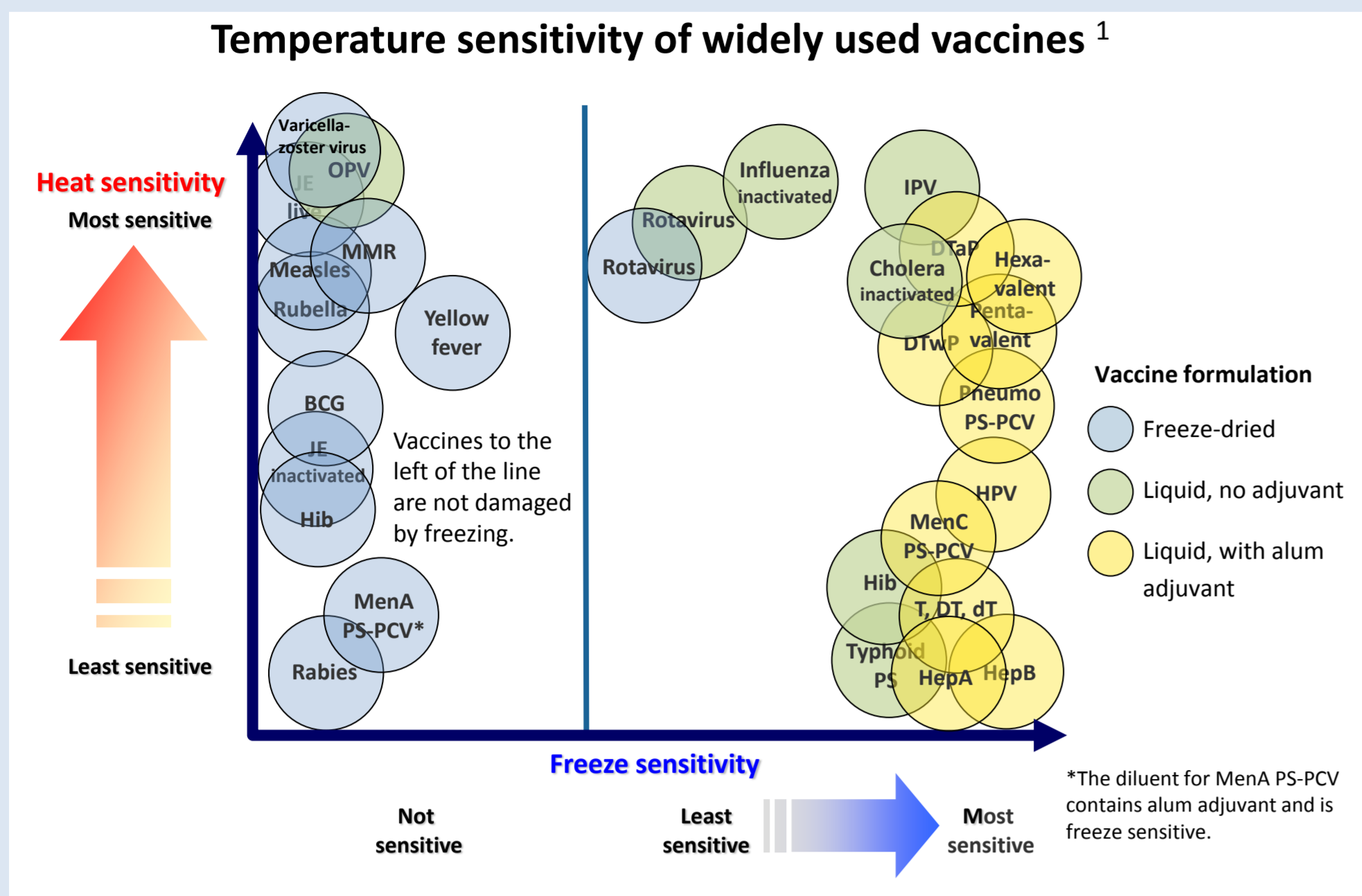
Freeze-free cold box & vaccine carrier technology and adoption considerations

Jaco Schoevers
Clinton Health Access Initiative, Inc.

Funding provided by:

BILL & MELINDA GATES foundation

Vaccines are temperature sensitive biological products that may experience a rapid loss in potency when exposed to freezing



59% of the vaccines procured from the UNICEF SD catalogue in 2015 were freeze-sensitive. This amounted to a total of **\$1.2 billion USD** worth of freeze-sensitive vaccines procured through UNICEF SD in 2015 alone^{2,4}

A vaccine carrier packed for outreach can contain approximately \$191.74 worth of vaccines. **\$171.84 (or 90%)** of this value can be destroyed by a single freezing event⁵

Freezing temperature events have been shown to occur frequently in the vaccine cold chain, including the transport segment



Cold chain temperatures less than 0°C occurred in the Philippines and Mongolia during **12% and 33%** of transport segments in the vaccine cold chain, respectively⁶

19.3% of transport and **18% of outreach** vaccine shipments were exposed to temperatures below recommended ranges in a study of 3-6 low-income countries⁷

Risk factors for freezing:



Insufficient preconditioning of ice packs:

- Healthcare workers often neglect to or have insufficient time for preconditioning of ice packs
- Healthcare workers may not know when an ice pack is sufficiently preconditioned



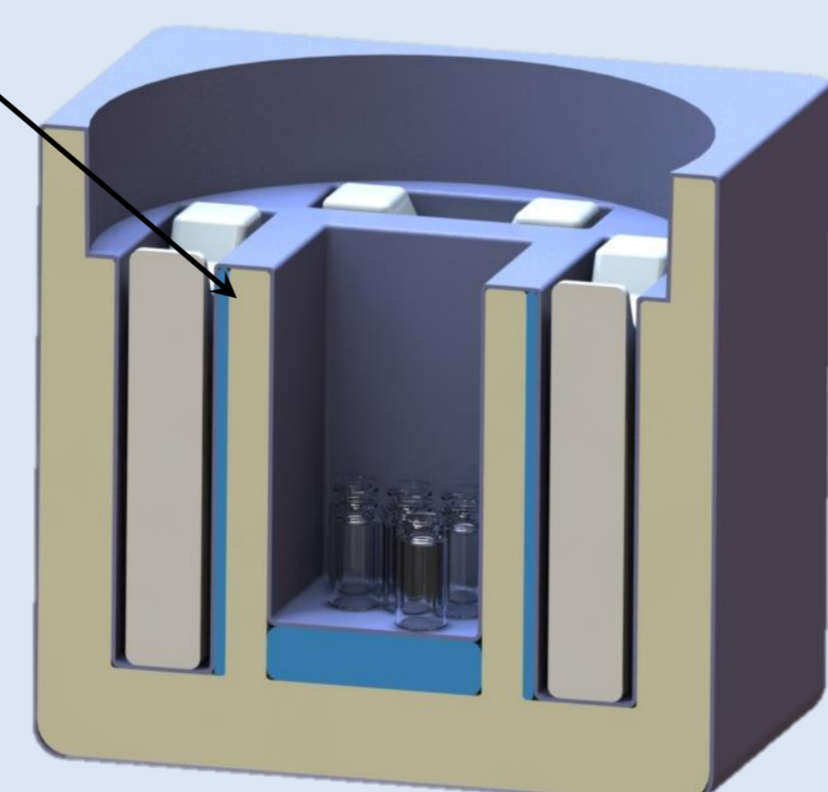
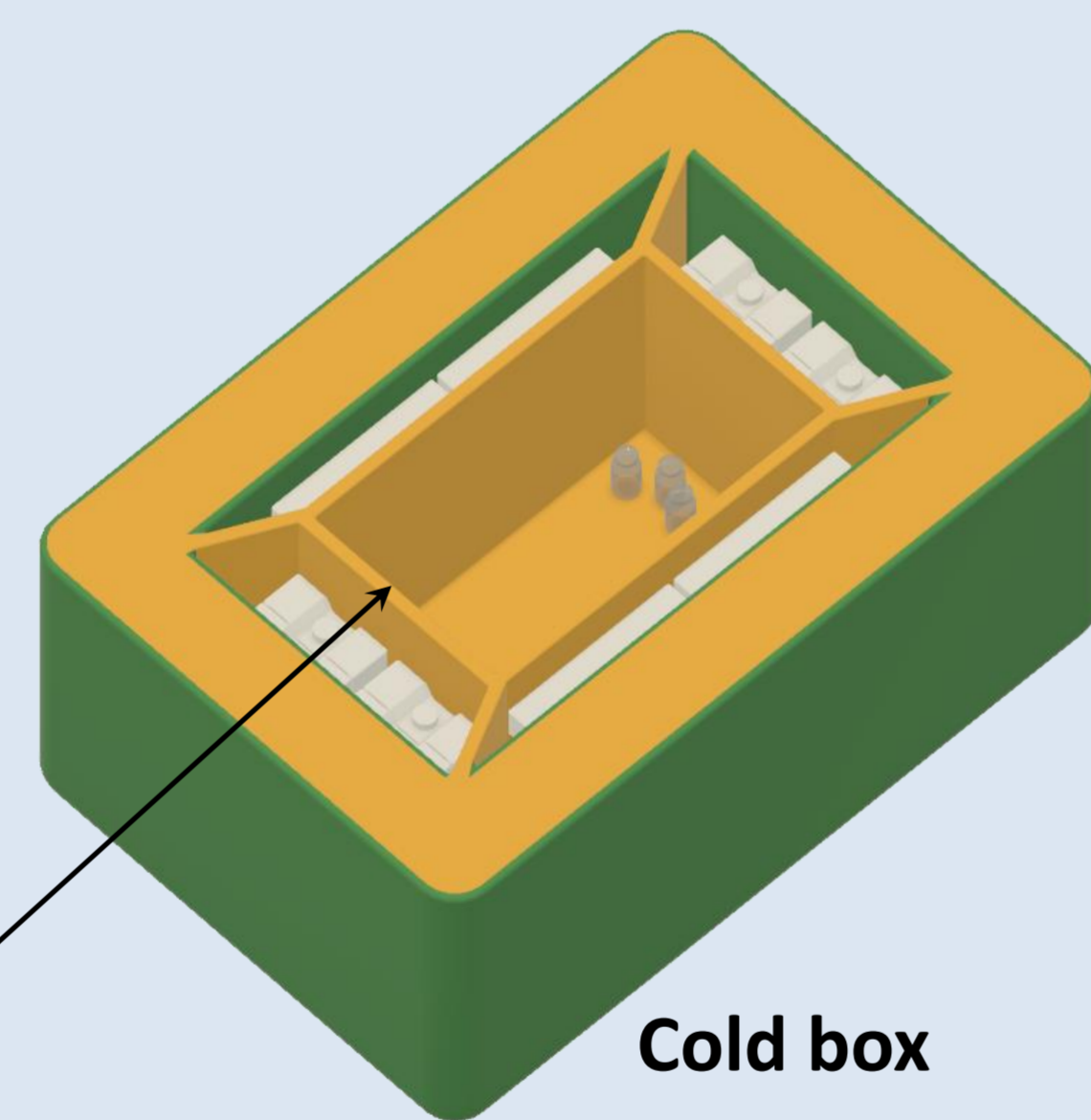
Incorrect vaccine packing:

- Healthcare workers often place vaccines directly on frozen ice packs³

Freeze-free cold boxes and vaccine carriers promise to solve the freezing issue without requiring ice pack preconditioning

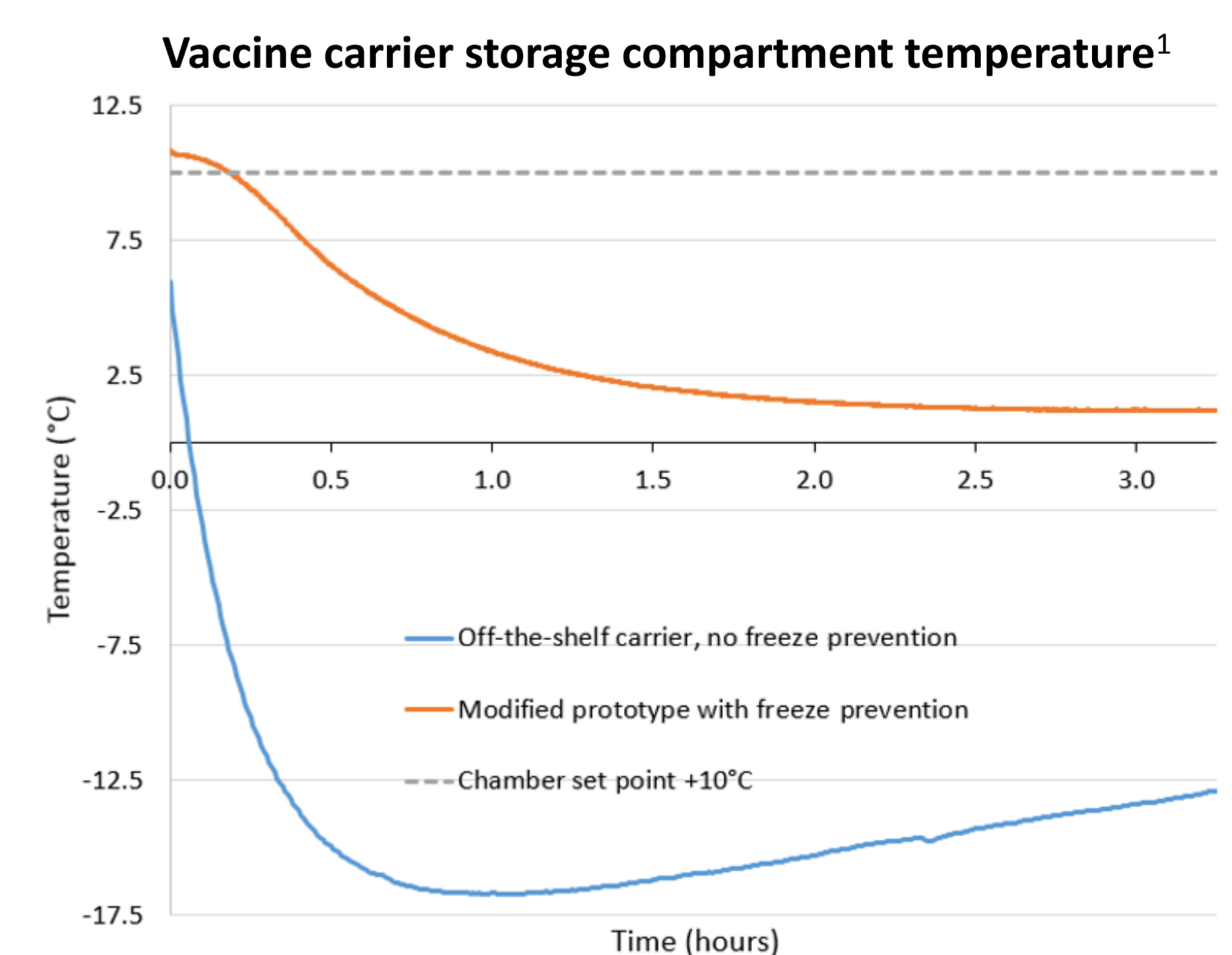
Freeze-free cold boxes and vaccine carriers work by **including a thin layer of insulating material between the ice packs and the vaccine storage compartment.**

In some cases, this technologically advanced insulating layer consists of phase change materials such as water. As the ice packs warm up from -25°C to 0°C, the insulating layer cools down and maintains a temperature greater than 0°C in the vaccine storage compartment, preventing the risk of freezing temperatures.



Freeze-free cold boxes and vaccine carriers prevent the risk of freezing by removing the need to precondition ice packs.

Tests have shown freeze-free vaccine carriers to be effective in **maintaining temperatures greater than 0°C** in the storage compartment, a marked improvement over conventional products. The test results below clearly show that the freeze-free vaccine carrier's storage compartment temperature remains above 0°C, while the conventional product's temperature drops well below 0°C.



Freeze-free cold boxes and vaccine carriers are the highest potential solution to solve the freezing issue during transport & outreach

	Protection against freezing, independent of user behavior	Capable of supporting longer transport/ outreach sessions	Fit with ecosystem in existing ice-based supply chain	No time needed to precondition ice packs	Scalability and value for money
Preconditioned Ice Packs	✗	✓	✓	✗	✓
Chilled Water Packs	✓	✗	✗	✓	✗
Freeze-free Cold Boxes and Vaccine Carriers	✓	✓	✓	✓	✓

If interested in more information on this topic, please contact **Jaco Schoevers (jschoevers@clintonhealthaccess.org)** at this conference. There are also dedicated sessions on this topic on **Day 3 @ 11:00 and Day 5 @ 09:30.**

¹Image Credit: PATH
²UNICEF Supplies and logistics [http://www.unicef.org/supply/ - 24 April 2016]
³Philippines, routine immunization, 2012. Image Credit: PATH/Tina Lorenson
⁴UNICEF. Supply annual report 2015 UNICEF supply division [http://www.unicef.org/supply/files/UNICEF_Supply_Annual_Report_2015.pdf - 14 July 2016]
⁵Assuming a single outreach session for 20 children and BCG, MR, Penta, Rota, PCV-13, and IPV/OPV in routine immunization schedule. Assumption that 20 doses of both OPV and IPV are carried in outreach session as there will be variance in the age of children being immunized - PATH
⁶The Government of the Philippines and UNICEF. Study on temperature monitoring of EPI vaccine. 2010 AND UNICEF. Temperature monitoring of EPI in Mongolia. 2011
⁷Hanson CM, George AM, Sawadogo A, Schreiber B. Is freezing in the vaccine cold chain an ongoing issue? A literature review. *Vaccine*. 2017 Apr 19;35(17):2127-2133. doi:10.1016/j.vaccine.2016.09.070