Aid and Aids
PEPFAR, trade, and contagious disease

Logan Stundal[1,2] Sonal Pandya[3] David Leblang[2,3]

Slides prepared for APSA 2023, Los Angeles

1. Biocomplexity Institute, University of Virginia
2. Batten School of Public Policy, University of Virginia
3. Department of Politics, University of Virginia

- Do we observe evidence of international trade-based HIV diffusion?

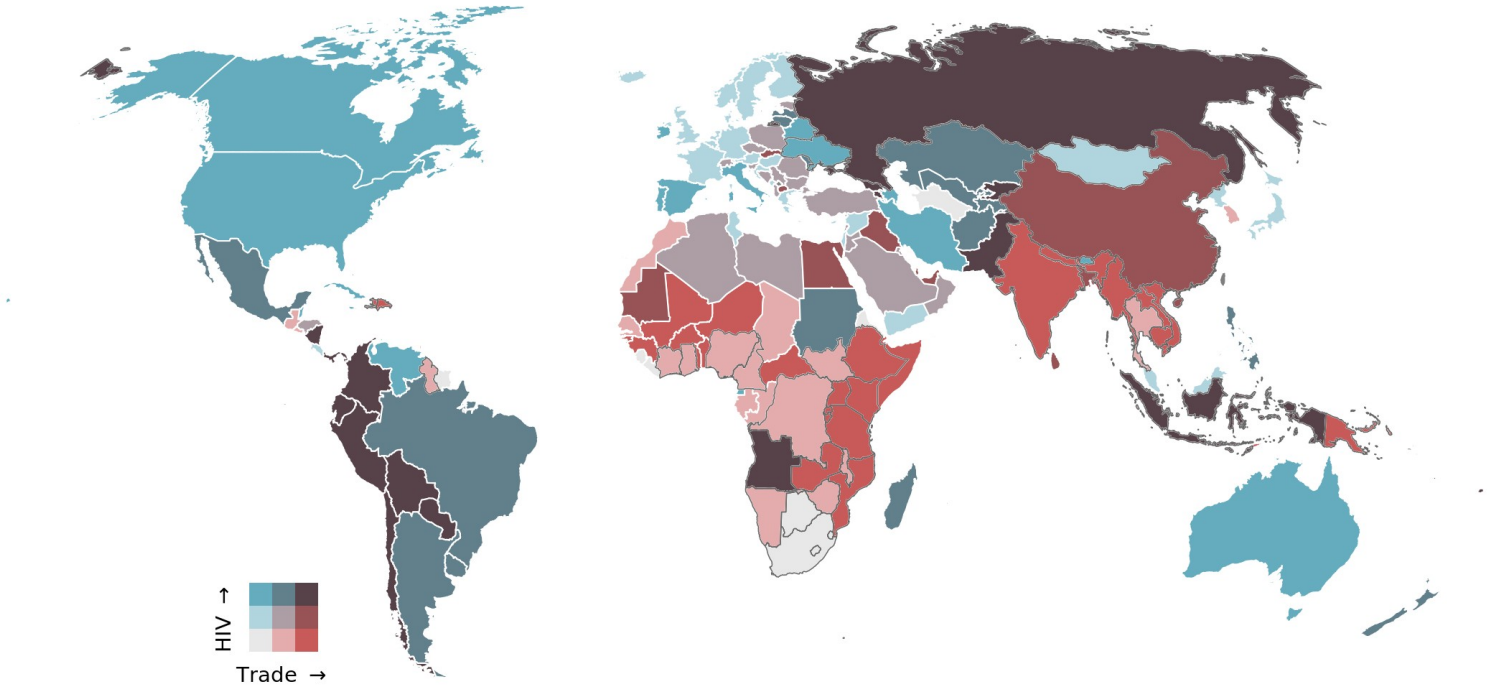
- Do we observe evidence of international trade-based HIV diffusion?

- H1 – Global trade connectedness provides a diffusion pathway for HIV incidence.

- Do we observe evidence of international trade-based HIV diffusion?

  - H1 – Global trade connectedness provides a diffusion pathway for HIV incidence.
  - H2 – Trade with PEPFAR recipients moderates the effect for PEPFAR aid.

H1 - Global trade connectedness provides a diffusion pathway for HIV incidence



H2 - Trade with PEPFAR recipients moderates the effect for PEPFAR aid

		Trade with PEPFAR Recipeints	
		Low	High
PEPFAR Recipient	No	-0.625 [-0.816, -0.434] Observations: 1971	-2.958 [-4.280, -1.637] Observations: 263
	Yes	-7.260 [-9.336, -5.183] Observations: 189	-26.163 [-29.672, -22.653] Observations: 211

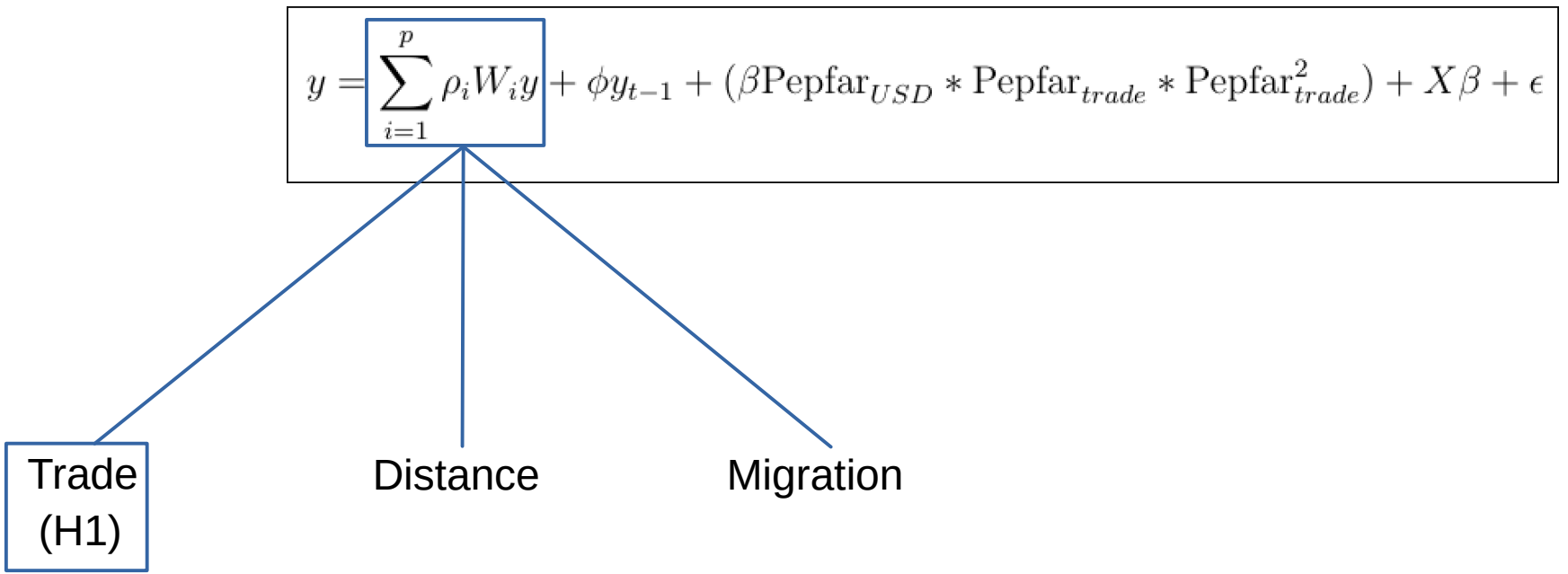
H2 - Trade with PEPFAR recipients moderates the effect for PEPFAR aid

		Trade with PEPFAR Recipeints	
		Low	High
PEPFAR Recipient	No	-0.625 [-0.816, -0.434] Observations: 1971	-2.958 [-4.280, -1.637] Observations: 263
	Yes	-7.260 [-9.336, -5.183] Observations: 189	-26.163 [-29.672, -22.653] Observations: 211

H2 - Trade with PEPFAR recipients moderates the effect for PEPFAR aid

PEPFAR Recipient	Trade with PEPFAR Recipeints: Low	Trade with PEPFAR Recipeints: High
No	-0.625 [-0.816, -0.434] Observations: 1971	-2.958 [-4.280, -1.637] Observations: 263
Yes	-7.260 [-9.336, -5.183] Observations: 189	-26.163 [-29.672, -22.653] Observations: 211

$$y = \sum_{i=1}^{p} \rho_i W_i y + \phi y_{t-1} + (\beta \text{Pepfar}_{USD} * \text{Pepfar}_{trade} * \text{Pepfar}_{trade}^2) + X\beta + \epsilon$$


$y = \sum_{i=1}^{p} \rho_i W_i y + \phi y_{t-1} + (\beta \text{Pepfar}_{USD} * \text{Pepfar}_{trade} * \text{Pepfar}^2_{trade}) + X\beta + \epsilon$
Trade (H1)
Distance
Migration

(H2)

$$y = \sum_{i=1}^{p} \rho_i W_i y + \phi y_{t-1} + (\beta \text{Pepfar}_{USD} * \text{Pepfar}_{trade} * \text{Pepfar}^2_{trade}) + X\beta + \epsilon$$

Trade (H1)

Distance

Migration

	Non-spatial		Spatial		
	[1]	[2]	[3]	[4]	[5]
PEPFAR Aid	−0.468* [−0.724; −0.219]	−0.489* [−0.737; −0.246]	−0.486* [−0.740; −0.239]	−0.488* [−0.728; −0.247]	−0.490* [−0.744; −0.239]
PEPFAR Aid × PEPFAR Trade	3.962* [2.034; 5.842]	3.936* [2.028; 5.894]	3.961* [1.972; 5.962]	4.110* [2.086; 6.059]	4.115* [2.018; 6.138]
PEPFAR Aid × PEPFAR Trade^2	−8.524* [−12.647; −4.412]	−8.342* [−12.428; −4.309]	−8.572* [−12.873; −4.361]	−8.931* [−13.232; −4.594]	−8.930* [−13.222; −4.464]
PEPFAR Aid × PEPFAR Trade × PEPFAR Trade^2	5.559* [3.011; 8.118]	5.498* [2.932; 8.072]	5.722* [3.132; 8.337]	5.948* [3.222; 8.637]	5.945* [3.210; 8.656]
Spatial Lags					
Rho - Trade			0.117* [0.055; 0.176]	0.123* [0.064; 0.182]	0.123* [0.053; 0.189]
Rho - Distance				−0.108 [−0.279; 0.133]	−0.106 [−0.277; 0.139]
Rho - Migration					0.001 [−0.074; 0.071]
Temporal Lag					
HIV incidence rate (per 100k, lag)	0.622* [0.591; 0.653]	0.613* [0.581; 0.645]	0.612* [0.581; 0.644]	0.614* [0.582; 0.646]	0.614* [0.582; 0.645]
Controls	No	Yes	Yes	Yes	Yes
FE - Country	Yes	Yes	Yes	Yes	Yes
FE - Year	Yes	Yes	Yes	Yes	Yes
Log lik.	−6847.650	−6807.840	−6809.419	−6806.033	−6813.627
WAIC	14051.815	13986.454	13992.430	14007.591	14209.719
N	2634	2634	2634	2634	2634

* Null hypothesis value outside the confidence interval.

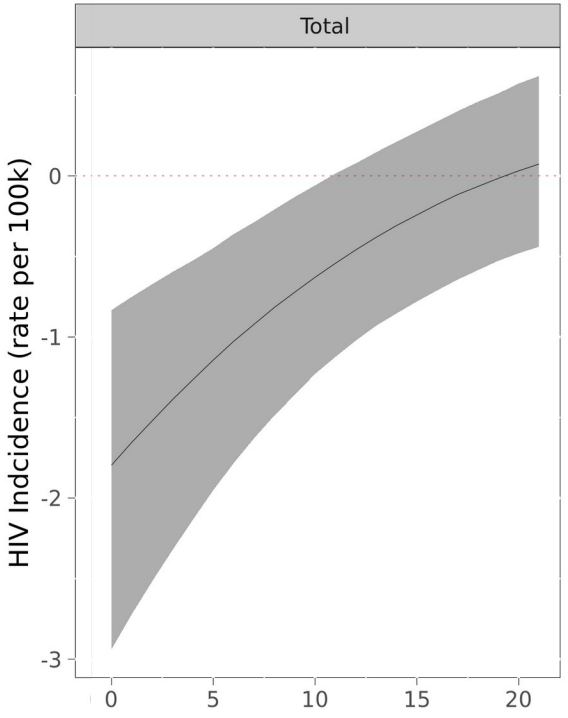
	Non-spatial		Spatial		
	[1]	[2]	[3]	[4]	[5]
PEPFAR Aid	−0.468* [−0.724; −0.219]	−0.489* [−0.737; −0.246]	−0.486* [−0.740; −0.239]	−0.488* [−0.728; −0.247]	−0.490* [−0.744; −0.239]
PEPFAR Aid × PEPFAR Trade	3.962* [2.034; 5.842]	3.936* [2.028; 5.894]	3.961* [1.972; 5.962]	4.110* [2.086; 6.059]	4.115* [2.018; 6.138]
PEPFAR Aid × PEPFAR Trade^2	−8.524* [−12.647; −4.412]	−8.342* [−12.428; −4.309]	−8.572* [−12.873; −4.361]	−8.931* [−13.232; −4.594]	−8.930* [−13.222; −4.464]
PEPFAR Aid × PEPFAR Trade × PEPFAR Trade^2	5.559* [3.011; 8.118]	5.498* [2.932; 8.072]	5.722* [3.132; 8.337]	5.948* [3.222; 8.637]	5.945* [3.210; 8.656]
Spatial Lags					
Rho - Trade			0.117* [0.055; 0.176]	0.123* [0.064; 0.182]	0.123* [0.053; 0.189]
Rho - Distance				−0.108 [−0.279; 0.133]	−0.106 [−0.277; 0.139]
Rho - Migration					0.001 [−0.074; 0.071]
Temporal Lag					
HIV incidence rate (per 100k, lag)	0.622* [0.591; 0.653]	0.613* [0.581; 0.645]	0.612* [0.581; 0.644]	0.614* [0.582; 0.646]	0.614* [0.582; 0.645]
Controls	No	Yes	Yes	Yes	Yes
FE - Country	Yes	Yes	Yes	Yes	Yes
FE - Year	Yes	Yes	Yes	Yes	Yes
Log lik.	−6847.650	−6807.840	−6809.419	−6806.033	−6813.627
WAIC	14051.815	13986.454	13992.430	14007.591	14209.719
N	2634	2634	2634	2634	2634

* Null hypothesis value outside the confidence interval.

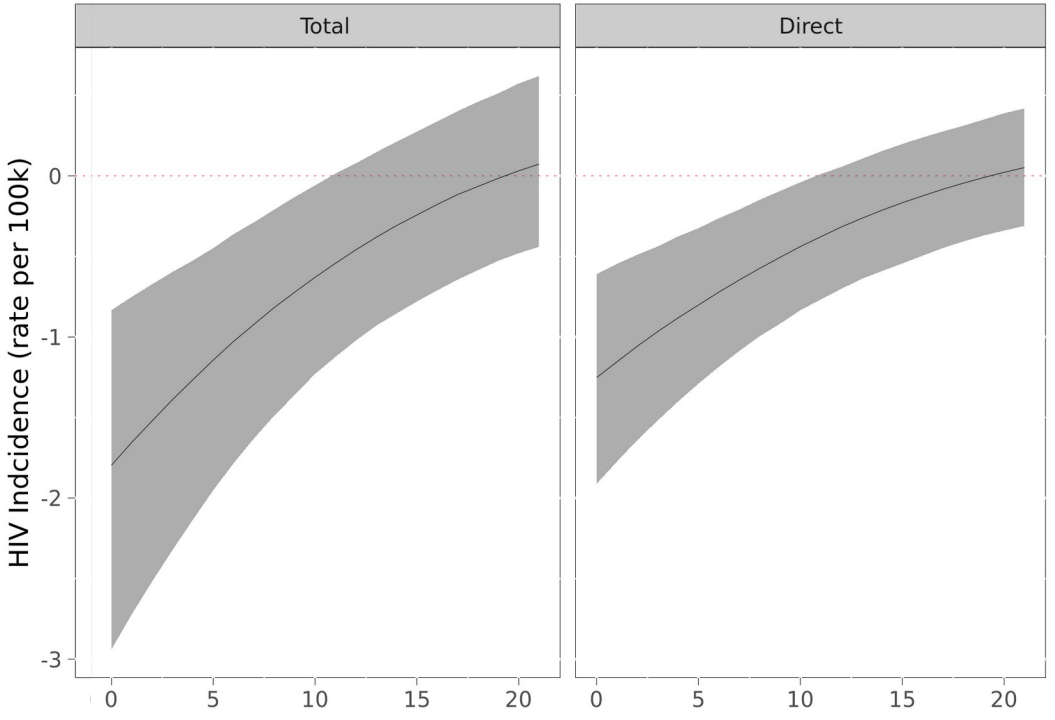
	Non-spatial		Spatial		
	[1]	[2]	[3]	[4]	[5]
PEPFAR Aid	−0.468* [−0.724; −0.219]	−0.489* [−0.737; −0.246]	−0.486* [−0.740; −0.239]	−0.488* [−0.728; −0.247]	−0.490* [−0.744; −0.239]
PEPFAR Aid × PEPFAR Trade	3.962* [2.034; 5.842]	3.936* [2.028; 5.894]	3.961* [1.972; 5.962]	4.110* [2.086; 6.059]	4.115* [2.018; 6.138]
PEPFAR Aid × PEPFAR Trade^2	−8.524* [−12.647; −4.412]	−8.342* [−12.428; −4.309]	−8.572* [−12.873; −4.361]	−8.931* [−13.232; −4.594]	−8.930* [−13.222; −4.464]
PEPFAR Aid × PEPFAR Trade × PEPFAR Trade^2	5.559* [3.011; 8.118]	5.498* [2.932; 8.072]	5.722* [3.132; 8.337]	5.948* [3.222; 8.637]	5.945* [3.210; 8.656]
Spatial Lags					
Rho - Trade			0.117* [0.055; 0.176]	0.123* [0.064; 0.182]	0.123* [0.053; 0.189]
Rho - Distance				−0.108 [−0.279; 0.133]	−0.106 [−0.277; 0.139]
Rho - Migration					0.001 [−0.074; 0.071]
Temporal Lag					
HIV incidence rate (per 100k, lag)	0.622* [0.591; 0.653]	0.613* [0.581; 0.645]	0.612* [0.581; 0.644]	0.614* [0.582; 0.646]	0.614* [0.582; 0.645]
Controls	No	Yes	Yes	Yes	Yes
FE - Country	Yes	Yes	Yes	Yes	Yes
FE - Year	Yes	Yes	Yes	Yes	Yes
Log lik.	−6847.650	−6807.840	−6809.419	−6806.033	−6813.627
WAIC	14051.815	13986.454	13992.430	14007.591	14209.719
N	2634	2634	2634	2634	2634

* Null hypothesis value outside the confidence interval.

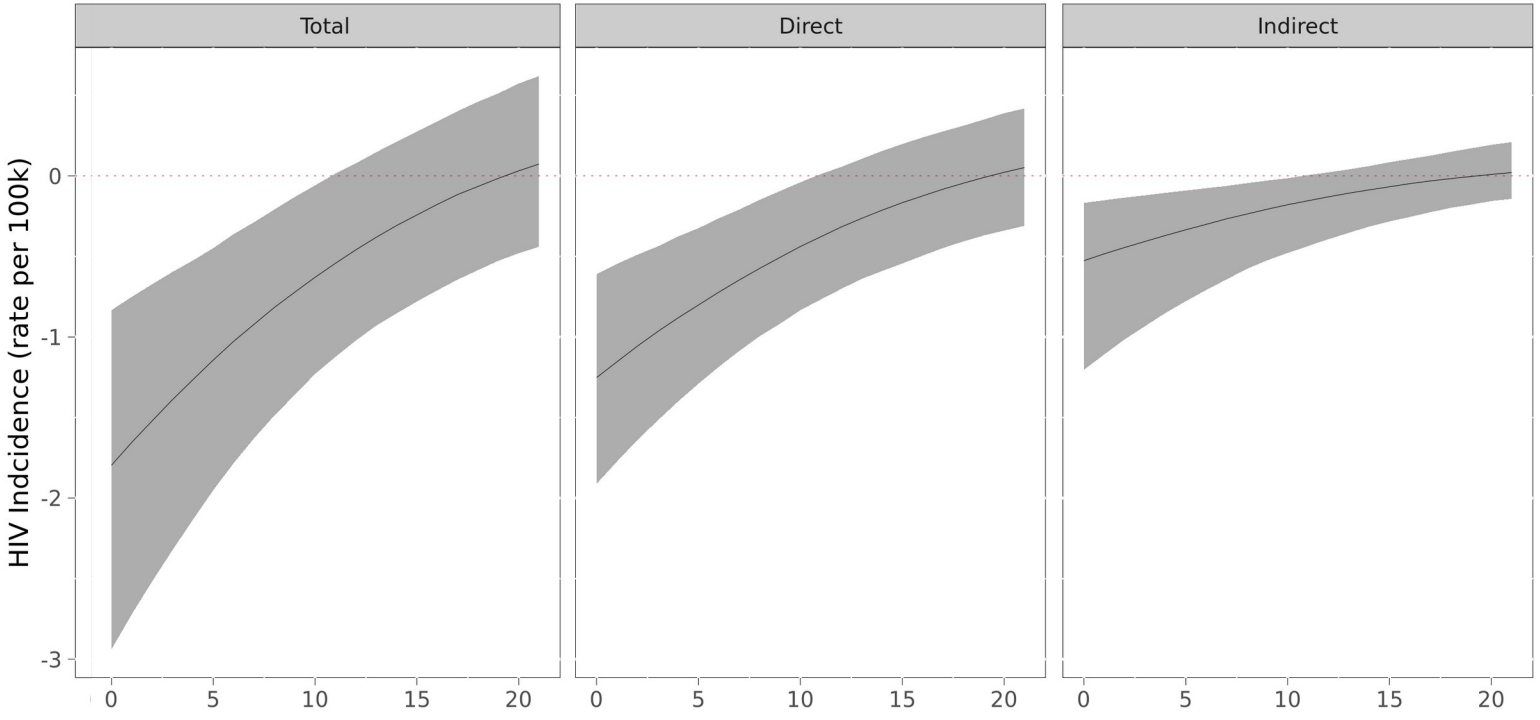
LRSS conditional effects of PEPFAR aid on HIV incidence as trade with other PEPFAR recipients increases



LRSS conditional effects of PEPFAR aid on HIV incidence as trade with other PEPFAR recipients increases



LRSS conditional effects of PEPFAR aid on HIV incidence as trade with other PEPFAR recipients increases



PEPFAR aid allocation counterfactual

	Direct	Indirect
Guinea Bissau	-54.3^*	-2175.3^*
	$[-84.9; -24.9]$	$[-4985.9; -662.9]$
Gabon	-35.7^*	-2140.5^*
	$[-61.9; -9.3]$	$[-5208.6; -413.8]$
Equatorial Guinea	-18.0^*	-1881.6^*
	$[-34.6; -1.3]$	$[-5069.7; -118.5]$
Djibouti	-10.7	-1178.4
	$[-22.4; 0.8]$	$[-3405.8; 83.1]$

* Null hypothesis value outside the confidence interval.

PEPFAR aid allocation counterfactual

	Direct	Indirect
Guinea Bissau	-54.3^*	-2175.3^*
	$[-84.9; -24.9]$	$[-4985.9; -662.9]$
Gabon	-35.7^*	-2140.5^*
	$[-61.9; -9.3]$	$[-5208.6; -413.8]$
Equatorial Guinea	-18.0^*	-1881.6^*
	$[-34.6; -1.3]$	$[-5069.7; -118.5]$
Djibouti	-10.7	-1178.4
	$[-22.4; 0.8]$	$[-3405.8; 83.1]$

* Null hypothesis value outside the confidence interval.

PEPFAR aid allocation counterfactual

	Direct	Indirect
Guinea Bissau	-54.3^*	-2175.3^*
	$[-84.9; -24.9]$	$[-4985.9; -662.9]$
Gabon	-35.7^*	-2140.5^*
	$[-61.9; -9.3]$	$[-5208.6; -413.8]$
Equatorial Guinea	-18.0^*	-1881.6^*
	$[-34.6; -1.3]$	$[-5069.7; -118.5]$
Djibouti	-10.7	-1178.4
	$[-22.4; 0.8]$	$[-3405.8; 83.1]$

* Null hypothesis value outside the confidence interval.

PEPFAR aid allocation counterfactual

	Direct	Indirect
Guinea Bissau	-54.3^*	-2175.3^*
	$[-84.9; -24.9]$	$[-4985.9; -662.9]$
Gabon	-35.7^*	-2140.5^*
	$[-61.9; -9.3]$	$[-5208.6; -413.8]$
Equatorial Guinea	-18.0^*	-1881.6^*
	$[-34.6; -1.3]$	$[-5069.7; -118.5]$
Djibouti	-10.7	-1178.4
	$[-22.4; 0.8]$	$[-3405.8; 83.1]$

* Null hypothesis value outside the confidence interval.

PEPFAR aid allocation counterfactual

	Direct	Indirect
Guinea Bissau	-54.3^*	-2175.3^*
	$[-84.9; -24.9]$	$[-4985.9; -662.9]$
Gabon	-35.7^*	-2140.5^*
	$[-61.9; -9.3]$	$[-5208.6; -413.8]$
Equatorial Guinea	-18.0^*	-1881.6^*
	$[-34.6; -1.3]$	$[-5069.7; -118.5]$
Djibouti	-10.7	-1178.4
	$[-22.4; 0.8]$	$[-3405.8; 83.1]$

* Null hypothesis value outside the confidence interval.

Indirect effects:
Top-3 reductions

Guinea Bissau
- China
- Pakistan
- Portugal

Gabon
- China
- India
- France

Equatorial Guinea
- China
- United States
- India

Conclusion

- Trade connections serve as a pathway for disease diffusion, amplifying impulses that increase or decrease disease incidence.
- PEPFAR matters most when distributed to countries with fewer trade opportunities with other PEPFAR recipients.
- PEPFAR authorization ends this month. The program has pivoted towars a “sustainability approach” to aid delivery.