



POSITIVA EDUCA
Pensando en ti

ORIENTACIONES PARA EL USO, MANTENIMIENTO Y DESECHO ADECUADO DE ELEMENTOS DE PROTECCIÓN PERSONAL



En este **2020 Positiva te acompaña**
con una estrategia en acción

NUESTRA ESTRATEGIA
ES **ACCION**
POSITIVA

POSITIVA
COMPANIA DE SEGUROS

POSITIVA EDUCA
Pensando en ti

Christian José Pallares Gutiérrez MD, MSc.

Coordinador medico comité de infecciones y vigilancia epidemiológica

CENTRO MÉDICO IMBANACO

Docente Vicerrectoría de Investigación

UNIVERSIDAD EL BOSQUE

Docente Escuela de Salud Pública y Epidemiología

UNIVERSIDAD JAVERIANA CALI



Sostenibilidad



Aliados
Estratégicos



Financiera



Cliente / Mercado



Eficiencia



Innovación



Capital
Estratégico

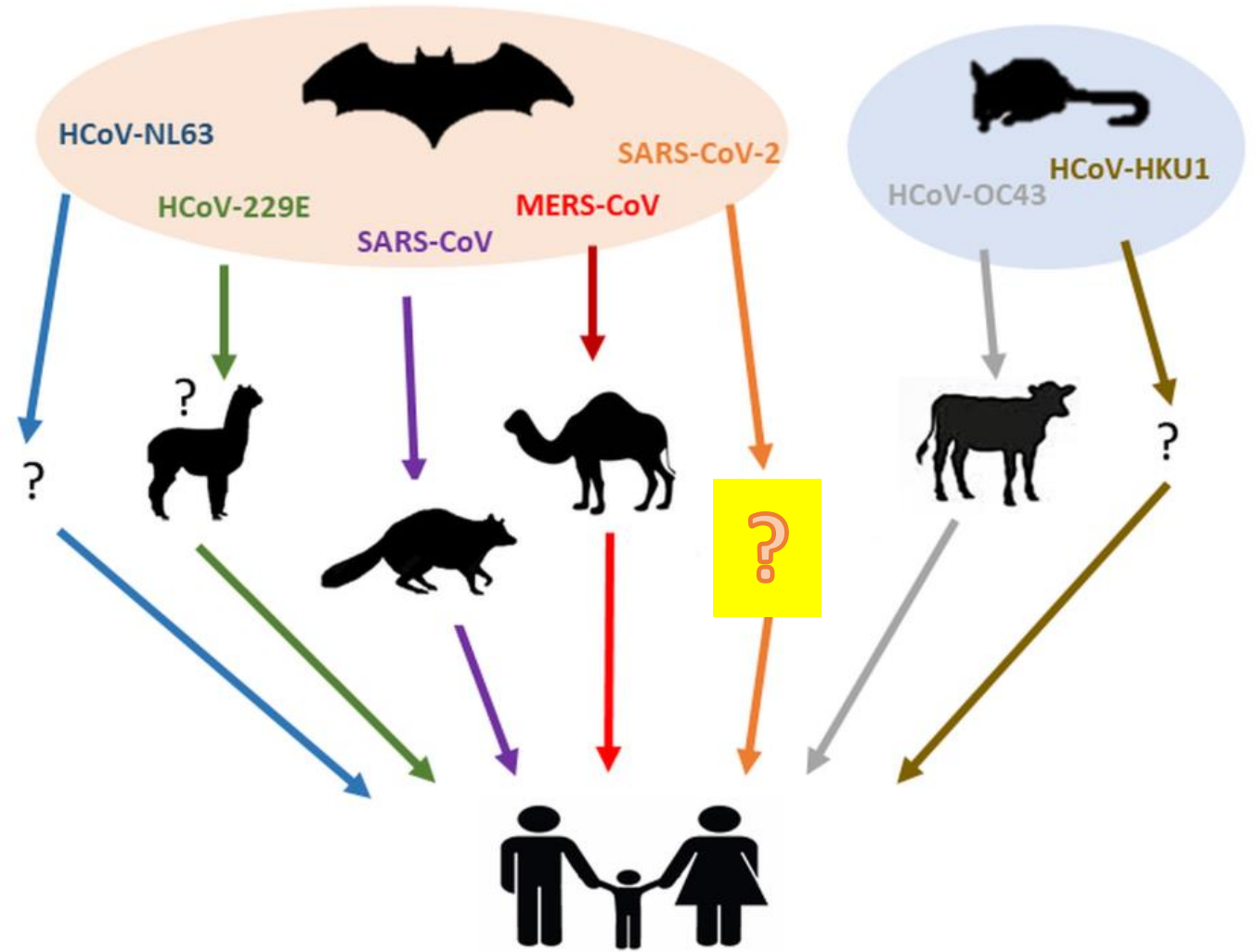


June Almeida



CORONAVIRUS

CORONAVIRUS



LETALIDAD: 10%



SARS (2003)

Infectados en Mundo:

8.098

Muertes probables en Mundo:

774

LETALIDAD: 6.7%



SARS-COV-2

Infectados a nivel global:

>25MILLONES Y CONTANDO

Muertes en el mundo

Muertes en Colombia

> 900.000 Y CONTANDO

> 20.000 Y CONTANDO

LETALIDAD: 34%



MERS (2012-19)

Infectados en Mundo:

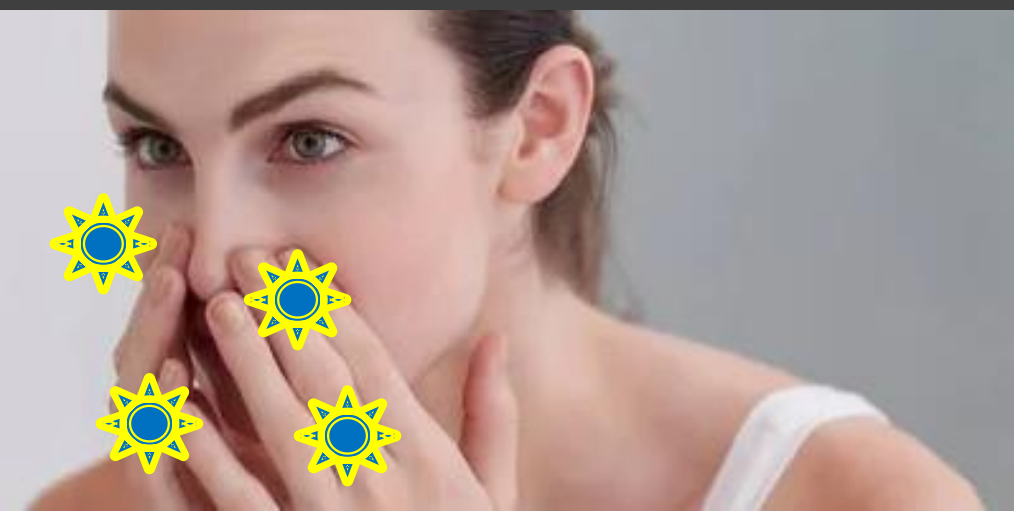
2.494

Muertes probables en Mundo:

858



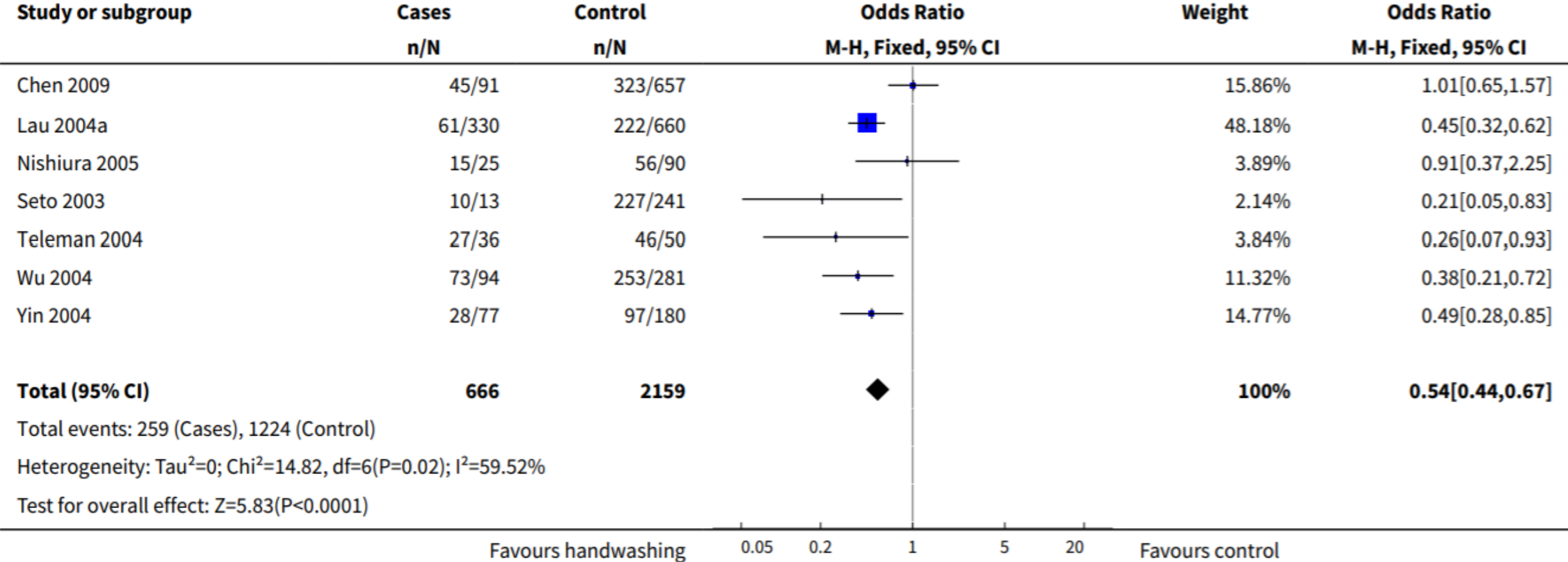
**LA CLAVE ESTA EN EL AMBIENTE
(superficies), NO EN EL AIRE.**



PRÁCTICA IMPORTANTE:
Higiene de manos

PRÁCTICA MÁS IMPORTANTE:

Higiene de manos



Jefferson T, Del Mar CB, Dooley L, Ferroni E, Al-Ansary LA, Bawazeer GA, van Driel ML, Nair NS, Jones MA, Thorning S, Conly JM. Physical interventions to interrupt or reduce the spread of respiratory viruses. Cochrane Database of Systematic Reviews 2011, Issue 7. Art. No.: CD006207. DOI: 10.1002/14651858.CD006207.pub4.

SURFACE		LIFESPAN OF COVID-19 VIRUS	
	Paper and tissue paper**	3 hours	
	Copper*	4 hours	
	Cardboard*	24 hours	■
	Wood**	2 days	■
	Cloth**	2 days	■
	Stainless steel*	2–3 days	■
	Polypropylene plastic*	3 days	■
	Glass**	4 days	■
	Paper money**	4 days	■
	Outside of surgical mask**	7 days	■

*At 69.8 to 73.4°F (21 to 23 °C) and 40% relative humidity

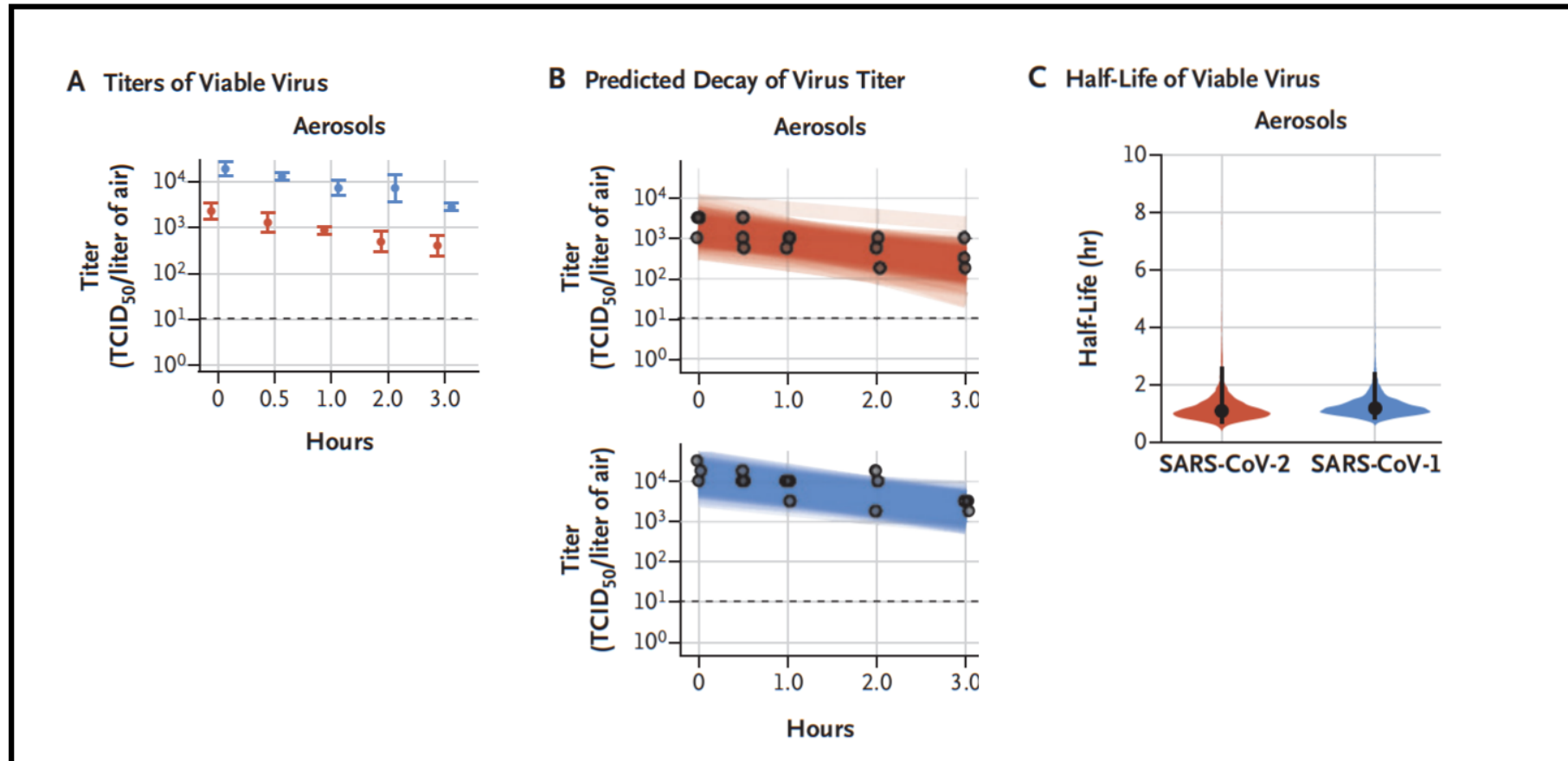
**At 71°F and 65% relative humidity

SOBREVIDA EN EL AMBIENTE

- 1) Pan Y, Zhang D, Yang P, Poon LLM, Wang Q. Viral load of SARS-CoV-2 in clinical samples. *Lancet Infect Dis* 2020; published online Feb 24. [https://doi.org/10.1016/S1473-3099\(20\)30113-4](https://doi.org/10.1016/S1473-3099(20)30113-4).
- 2) Ye G, Lin H, Chen L, et al. Environmental contamination of the SARS-CoV-2 in healthcare premises: an urgent call for protection for healthcare workers. *medRxiv* 2020; published online March 16. DOI:10.1101/2020.03.11.20034546 (preprint).
- 3) Chu DKW, Pan Y, Cheng SMS, et al. Molecular diagnosis of a novel coronavirus (2019-nCoV) causing an outbreak of pneumonia. *Clin Chem* 2020; published online Jan 31. DOI:10.1093/clinchem/hvaa029.
- 4) Van Doremalen N, Bushmaker T, Morris DH, et al. Aerosol and surface stability of SARSCoV-2 as compared with SARS-CoV-1. *N Engl J Med* 2020; published online March 17. DOI:10.1056/NEJMc2004973.

SOBREVIDA EN EL AIRE

- Estudio experimental (SARS-COV-1 y SARS-COV-2).
- **Vida media del virus en aerosoles: 1.1 horas IC95%= 0.64 - 2.64.**
- No incluyó el efecto de las corrientes de aire, temperatura y humedad relativa en el propio aire; sólo los incluyó para superficies de cobre, cartón, acero inoxidable y plástico.



SOBREVIDA EN AMBIENTE

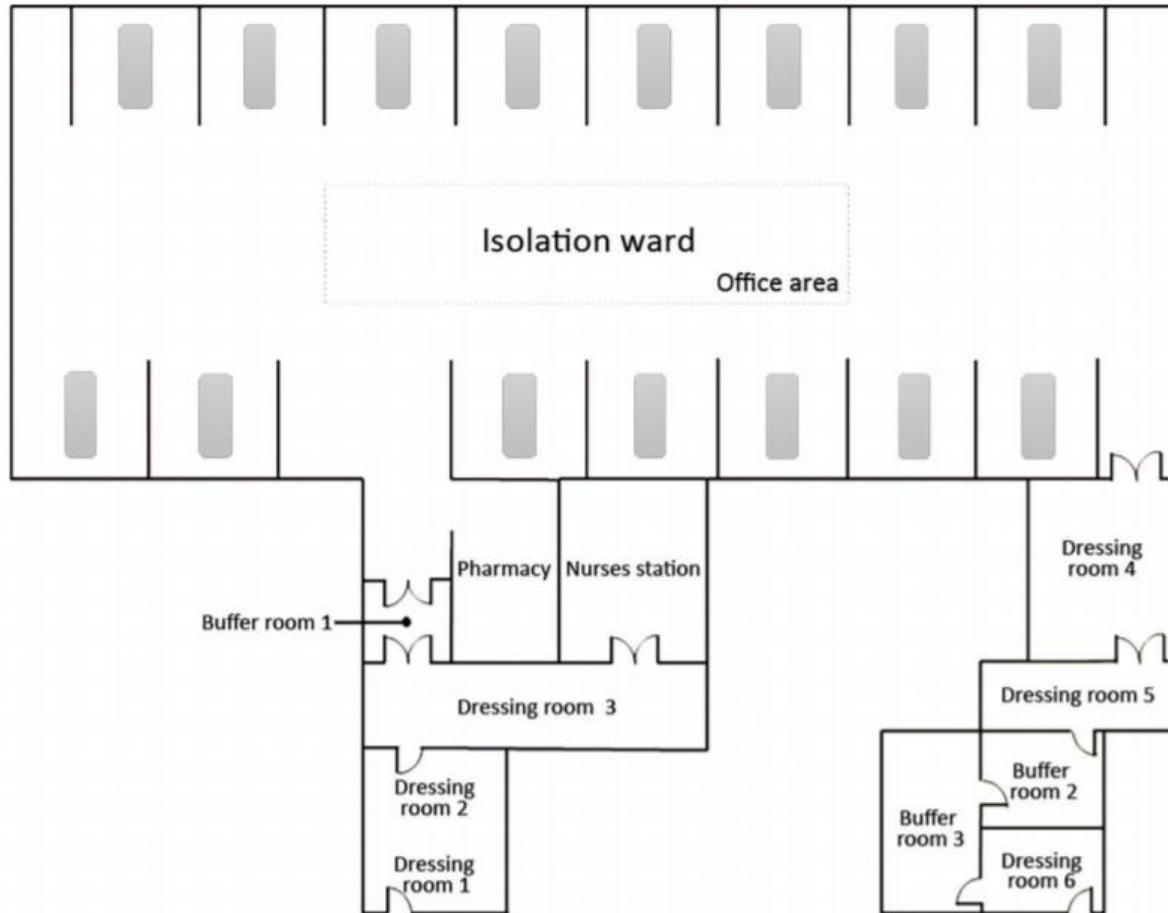


Table 1. Results of testing for SARS-CoV-2 in intensive care unit, Huoshenshan Hospital, Wuhan, China, 2020*

Area, sample	Intense positive/weak positive/negative†	Rate of positivity, %	Average virus concentration‡
Contaminated area			
Isolation wards			
Floor	6/1/3	70	6.6×10^4
Computer mouse	4/2/2	75	2.8×10^4
Trash can	0/3/2	60	3.4×10^4
Sickbed handrail	2/4/8	42.9	4.3×10^4
Patient mask	1/1/3	40	3.3×10^3
Air outlet filter	4/4/4	66.7	1.5×10^5
Indoor air near the air outlet (sampling site 1 in Figure 2, panel A)	2/3/9	35.7	3.8
Indoor air near the patients (sampling site 2 in Figure 2, panel A)	2/6/10	44.4	1.4
Indoor air near the doctors' office area (sampling site 3 in Figure 2, panel A)	0/1/7	12.5	0.52
Pharmacy			
Floor	3/0/0	100	7.45×10^4
Indoor air	0/0/5	0	ND
PPE			
Face shield of medical staff	0/0/6	0	ND
Sleeve cuff of medical staff	0/1/5	16.7	7.1×10^3
Glove of medical staff	0/1/3	25	2.9×10^3
Shoe sole of medical staff	3/0/3	50	3.2×10^4
Subtotal	27/27/70	43.5	NA
Semicontaminated area			
Buffer room 1			
Floor	0/0/5	0	ND
Air outlet filter	0/0/3	0	ND
Indoor air	0/0/5	0	ND
Doorknob	0/0/3	0	ND
Dressing room 4			
Floor	0/3/5	37.5	3.8×10^3
Air outlet filter	0/0/3	0	ND
Indoor air	0/0/5	0	ND
Doorknob	0/0/4	0	ND
Subtotal	0/3/33	8.3	NA
Clean area			
Dressing rooms 1, 2, and 3			
Doorknob	0/0/10	0	ND
Floor	0/0/12	0	ND
Indoor air	0/0/8	0	ND
Nurse station			
Doorknob	0/0/5	0	ND
Floor	0/0/5	0	ND
Indoor air	0/0/5	0	ND
Dressing rooms 5 and 6, buffer rooms 2 and 3			
Doorknob	0/0/12	0	ND
Floor	0/0/12	0	ND
Indoor air	0/0/12	0	ND
Subtotal	0/0/36	0	NA
Total	27/30/184	23.7	NA

*NA, not applicable; ND, not determined; PPE, personal protective equipment; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

†Intense positive indicates a positive result for both open reading frame 1ab gene and nucleoprotein gene of SARS-CoV-2; weak positive indicates a positive result for only 1 of the genes.

‡The average virus concentration of indoor air expressed as copies/L and of swab samples, as copies/sample.

SOBREVIDA EN AMBIENTE

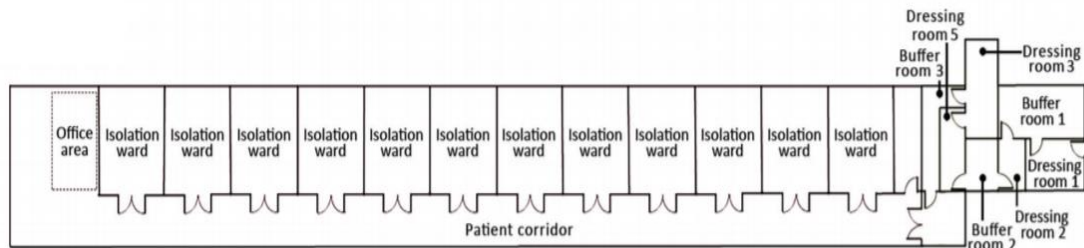


Table 2. Results of testing for SARS-CoV-2 in general ward, Huoshenshan Hospital, Wuhan, China, 2020*

Area, sample	Intense positive/weak positive/negative†	Rate of positivity, %	Average virus concentration‡
Contaminated area			
Isolation ward			
Floor	1/1/11	15.4	1.6×10^4
Doorknob	0/1/11	8.3	6.5×10^2
Air outlet	0/1/11	8.3	3.4×10^3
Sickbed handrail	0/0/12	0	ND
Patient mask	1/1/8	20	9.2×10^3
Indoor air (sampling site 1 in Figure 2, panel C)	0/2/9	18.2	0.68
Indoor air (sampling site 2 in Figure 2, panel C)	0/0/5	0	ND
Patient corridor			
Floor	0/0/10	0	ND
Computer mouse or keyboard	0/1/4	20	3.9×10^3
Trash can	0/0/8	0	ND
Indoor air	0/0/4	0	ND
PPE			
Face shield of medical staff	0/0/3	0	ND
Sleeve cuff of medical staff	0/0/3	0	ND
Glove of medical staff	0/0/3	0	ND
Shoe sole of medical staff	0/0/3	0	ND
Subtotal	2/7/105	7.9	NA
Semicontaminated area			
Dressing Room 4			
Floor	0/0/5	0	ND
Indoor air	0/0/5	0	ND
Doorknob	0/0/3	0	ND
Buffer Room 3			
Floor	0/0/5	0	ND
Indoor air	0/0/3	0	ND
Doorknob	0/0/3	0	ND
Subtotal	0/0/24	0	NA
Clean area			
Dressing Rooms 1, 2, 3, and 5			
Doorknob	0/0/12	0	ND
Floor	0/0/12	0	ND
Indoor air	0/0/6	0	ND
Buffer rooms 1 and 2			
Doorknob	0/0/6	0	ND
Floor	0/0/6	0	ND
Indoor air	0/0/4	0	ND
Subtotal	0/0/46	0	NA
Total	2/7/175	4.9	NA

SOBREVIDA EN EL AIRE



Table 1. Results of testing for SARS-CoV-2 in intensive care unit, Huoshenshan Hospital, Wuhan, China, 2020*

Area, sample	Intense positive/weak positive/negative†	Rate of positivity, %	Average virus concentration‡
Contaminated area			
Isolation wards			
Floor	6/1/3	70	6.6×10^4
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Trash can	0/3/2	60	3.4×10^4
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Indoor air near the air outlet	2/3/9	35.7	3.8
Indoor air near the patients	2/6/10	44.4	1.4
Indoor air near the doctors'	0/1/7	12.5	0.52

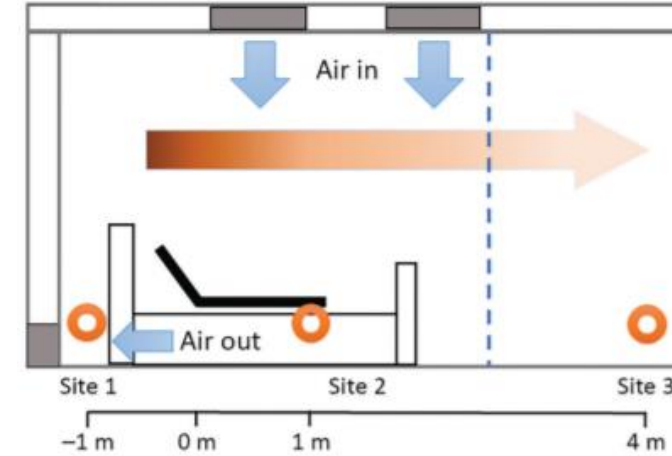
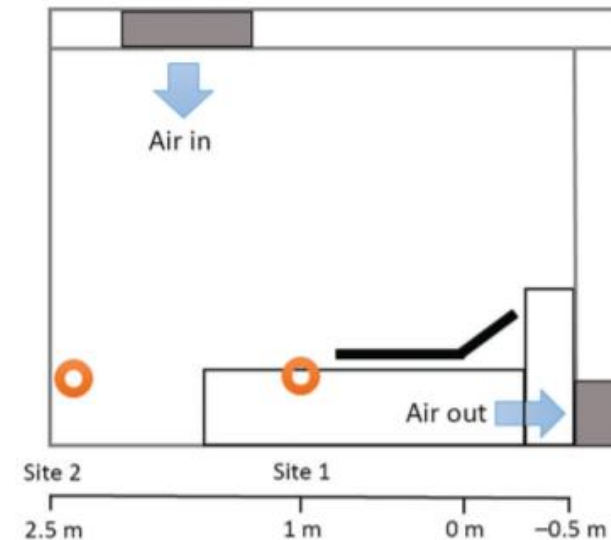


Table 2. Results of testing for SARS-CoV-2 in general ward, Huoshenshan Hospital, Wuhan, China, 2020*

Area, sample	Intense positive/weak positive/negative†	Rate of positivity, %	Average virus concentration‡
Contaminated area			
Isolation ward			
Floor	1/1/11	15.4	1.6×10^4
Doorknob	0/1/11	8.3	6.5×10^2
Air outlet	0/1/11	8.3	3.4×10^3
Sickbed handrail	0/0/12	0	ND
Patient mask	1/1/8	20	9.2×10^3
Indoor air	0/2/9	18.2	0.68
Indoor air	0/0/5	0	ND



SOBREVIDA EN AMBIENTE

Infectious Diseases Emergency Unit



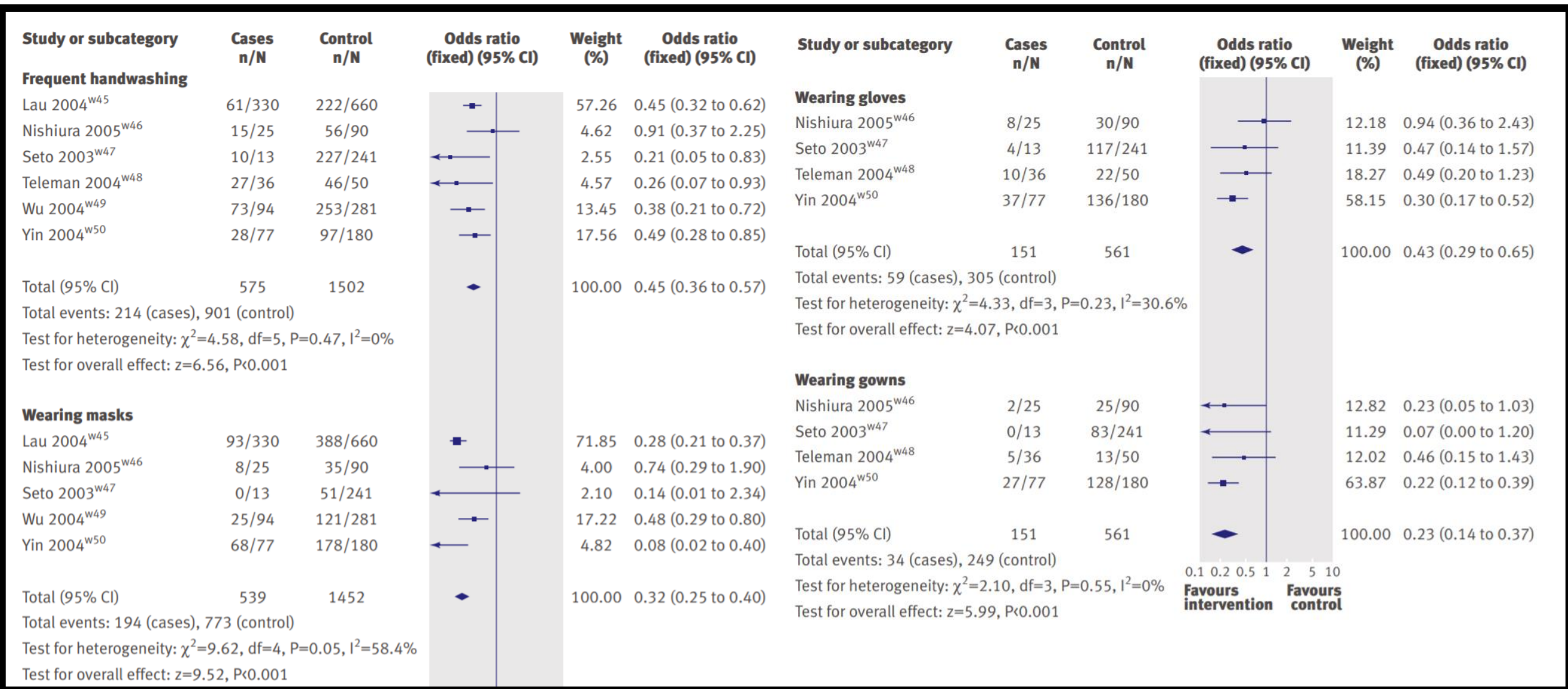
Sub-intensive Care Ward





PRECAUCIONES POR CONTACTO Y GOTAS

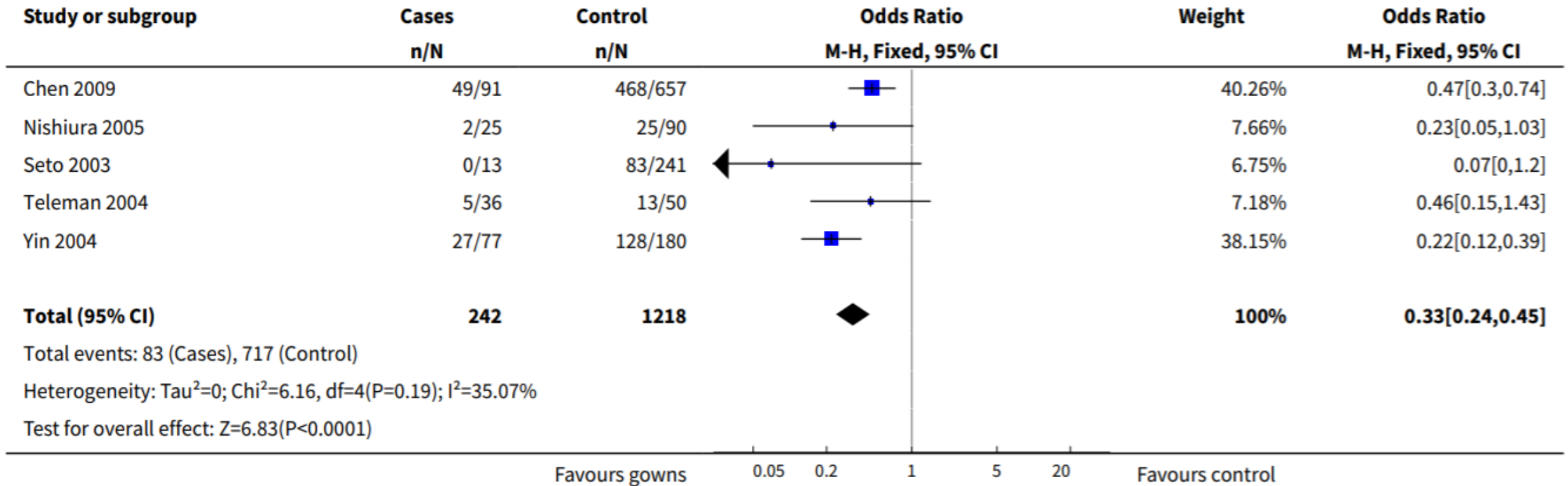
PRECAUCIONES POR CONTACTO Y GOTAS





PRECAUCIONES POR CONTACTO

PRECAUCIONES POR CONTACTO: *Uso de bata*



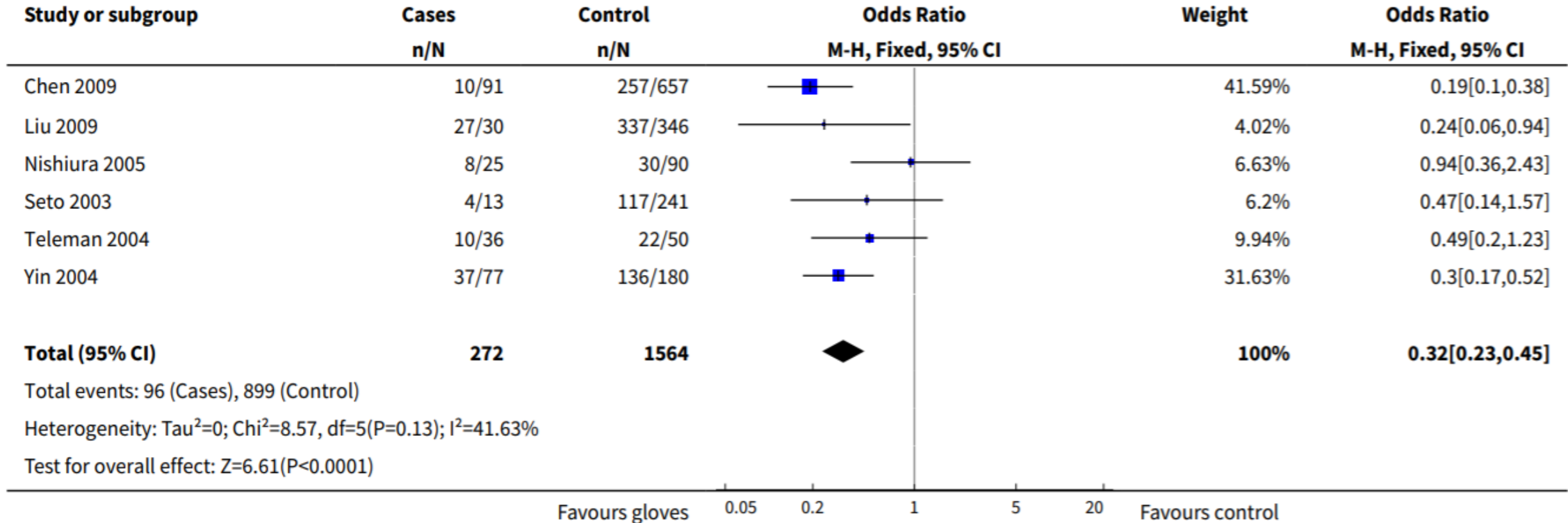
CONSIDERACIONES EN EL USO DE BATA

“Durante el contacto con los pacientes, **las batas son contaminadas** por microorganismos multiresistentes hospitalarios” (1,2), además de esto “**Los uniformes del personal de salud se contaminan** en la región abdominal, mas no en otros sitios” (3).

DEBIDO A ESTO LAS BATAS NO SON REUTILIZABLES Y SE DEBEN DESECHAR LUEGO DE LA ATENCIÓN

- (1) Morgan DJ et al. Frequent multirug-resistant *Acinetobacter baumannii* contamination of gloves, gowns and hands of healthcare workers. *Infect Control Hosp Epidemiol* 2010; 31 (7): 716-721.
- (2) Snyder GM et al. Detection of methicillin-resistant *Staphylococcus aureus* and vancomycin-resistant *Enterococci* on the gowns and gloves of healthcare workers. *Infect Control Hosp Epidemiol* 2008; 29 (7): 583-9.
- (3) Pilonetto M et al. Hospital gowns as a vehicle for bacterial dissemination in an intensive care unit. *Braz J Infect Dis*. 2004; 8 (3): 206-10

PRECAUCIONES POR CONTACTO: *Uso de guantes*



EL PELIGRO DE USAR GANTES

Cuando no están indicados

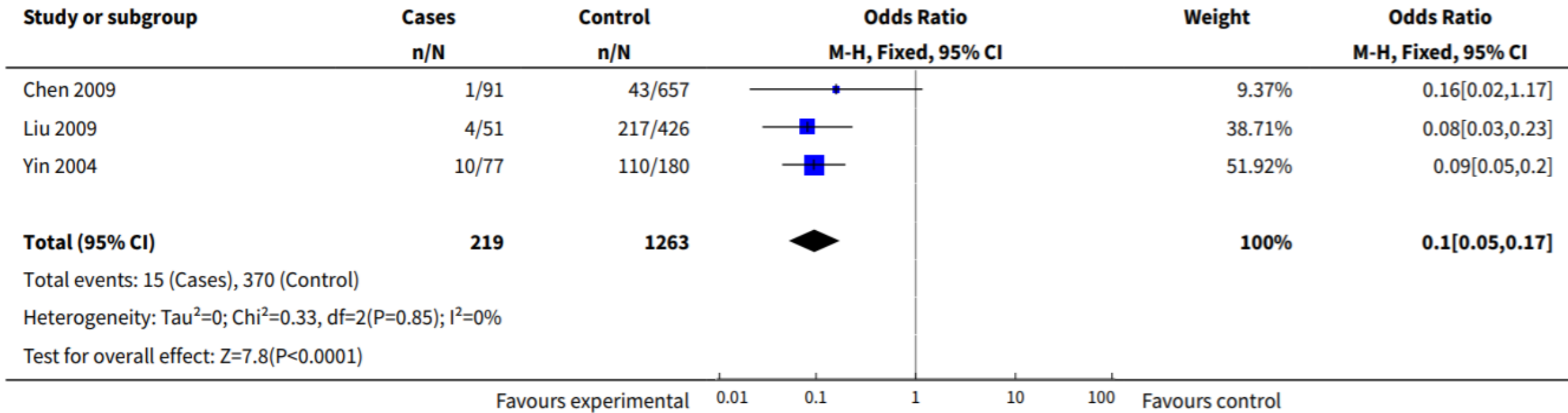
- Contaminación del guante: **66%**.
- Retiro adecuado (un solo uso): **64%**.
- Trasmisión cruzada: **>20%**.
- Mala adherencia a higiene de manos: **61%-74%**.





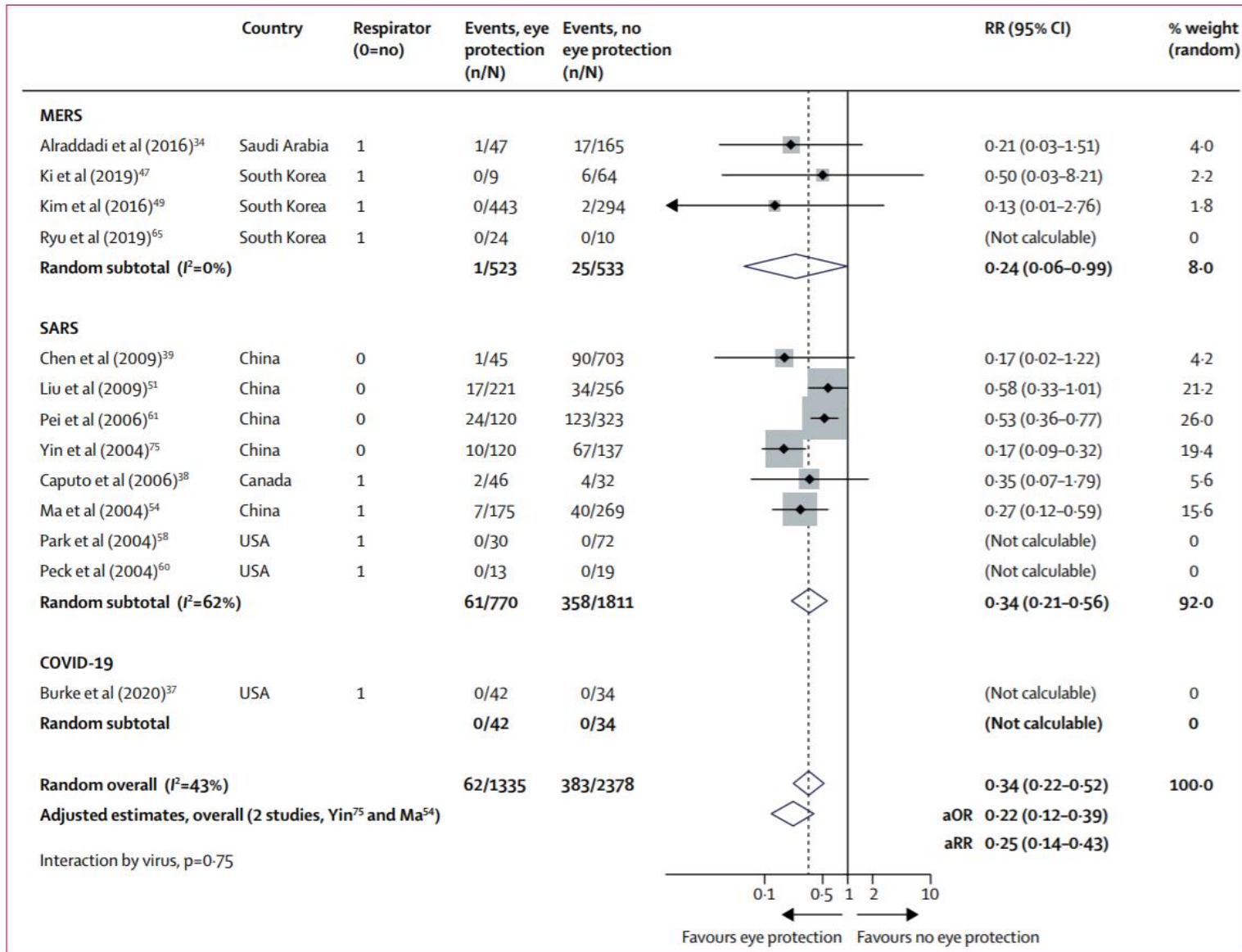
PRECAUCIONES POR
GOTAS

PRECAUCIONES POR GOTAS: *Uso de protección ocular*



PRECAUCIONES POR GOTAS:

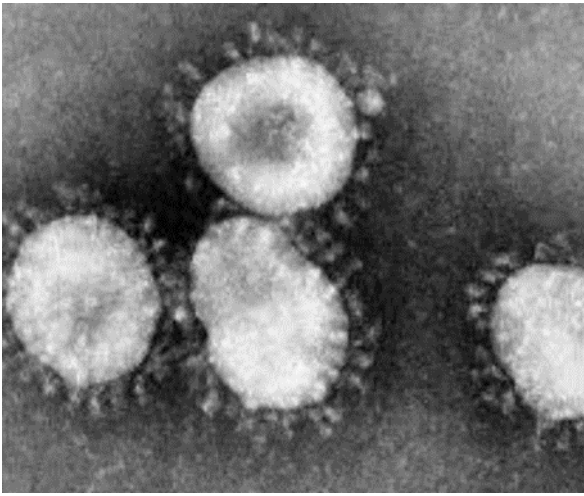
Protección ocular



MASCARILLA: ¿CUANDO USAR UNA O LA OTRA?

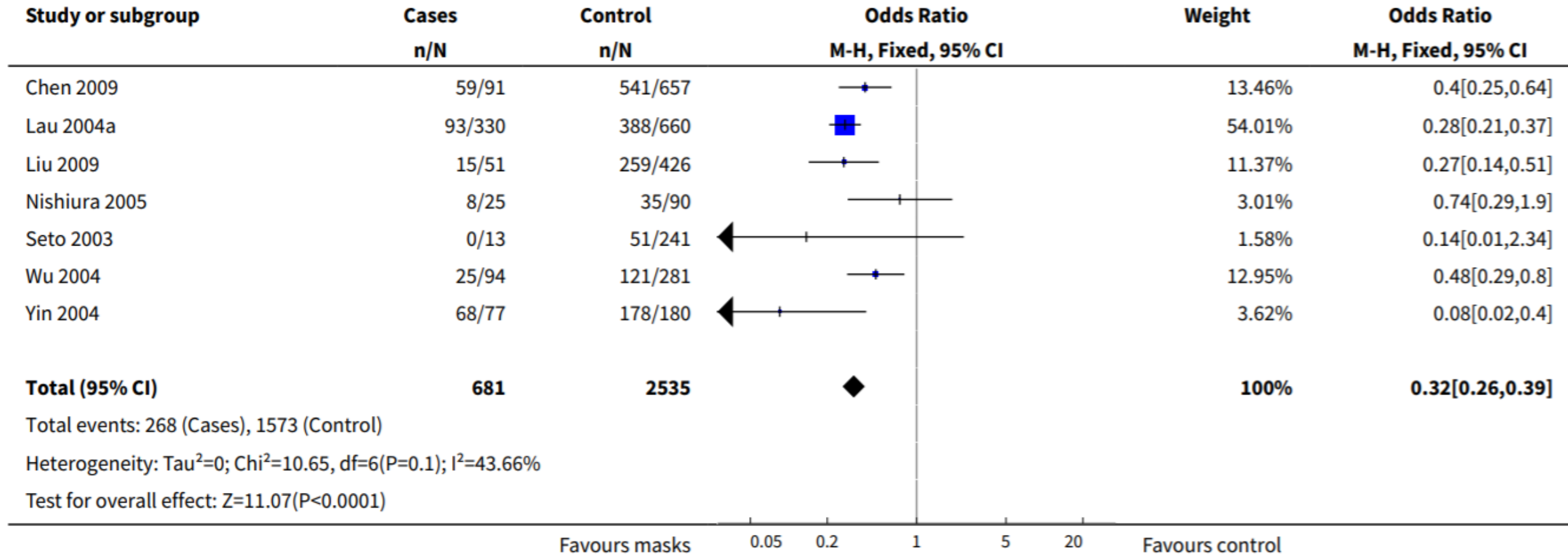


MODELO CERCANO: SARS-COV-1

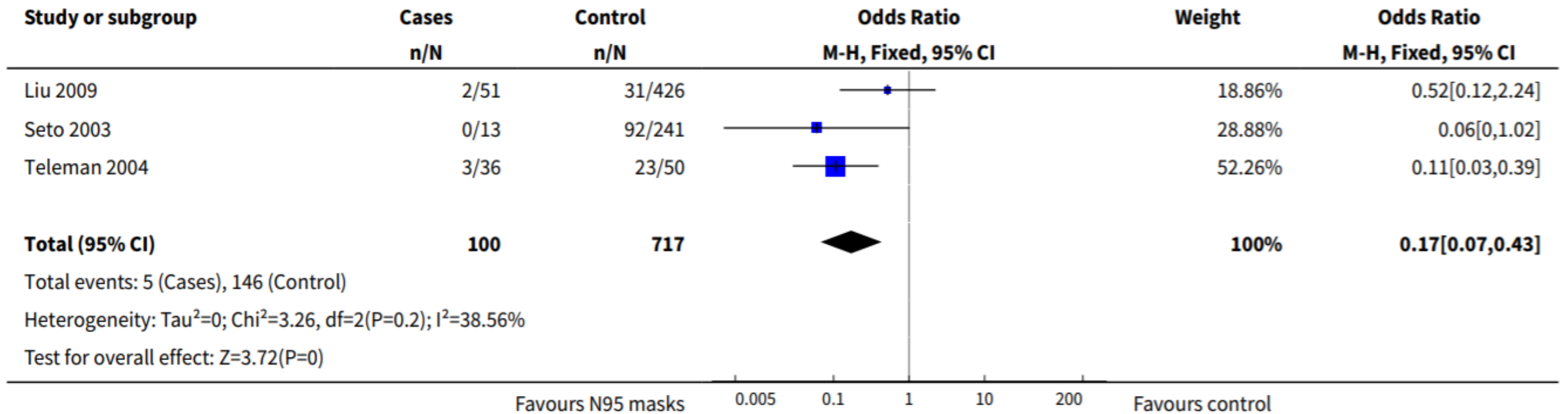


- Mascarillas (OR = 0.13; 95% CI: 0.03–0.62)
Hasta 38% en el peor de los escenarios
- N95 (OR = 0.12; 95% CI: 0.06–0.26)
Hasta 74% en el peor de los escenarios.

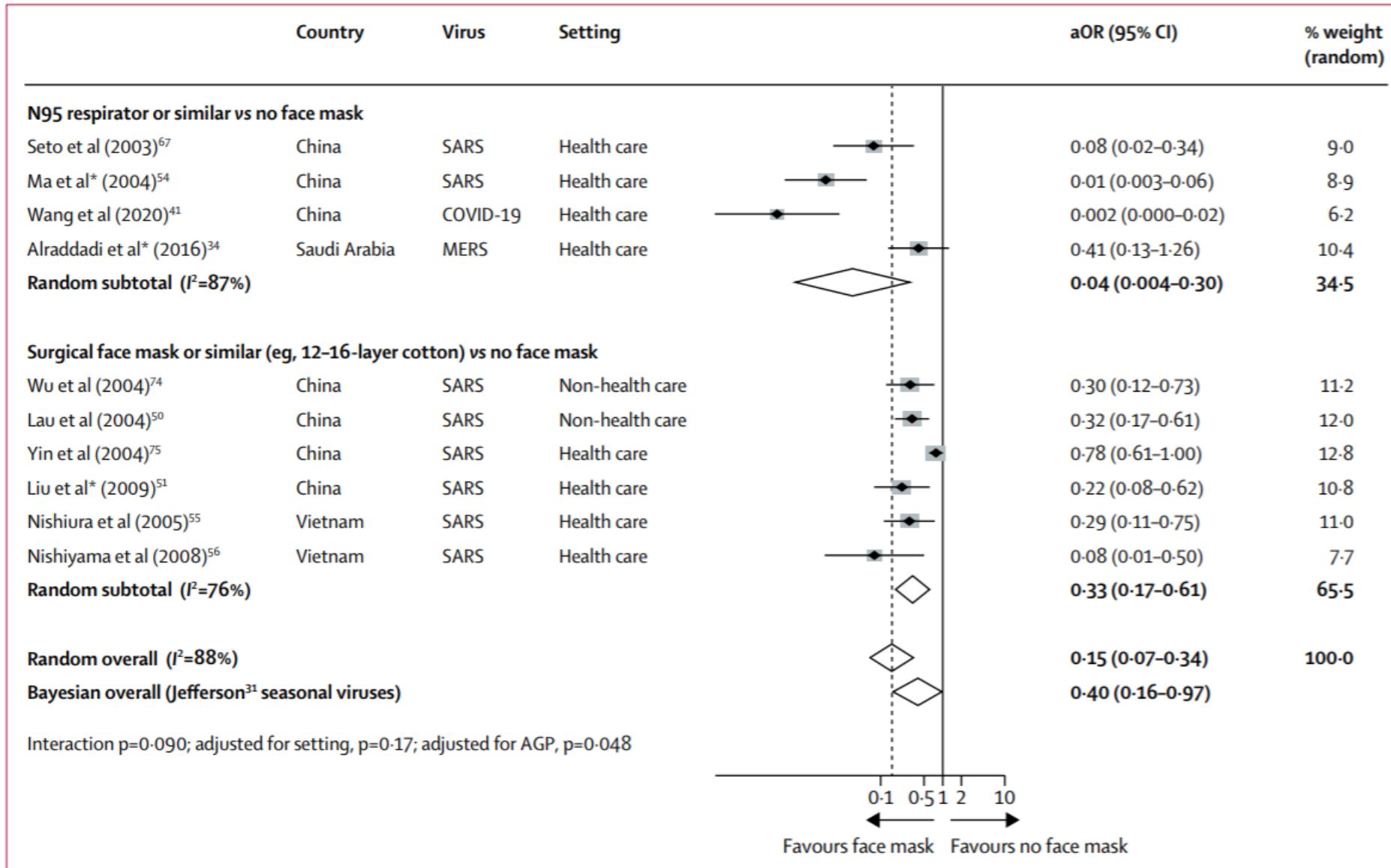
PRECAUCIONES POR GOTAS: *Uso de mascarilla quirúrgica*



PRECAUCIONES POR GOTAS: *Uso de mascarilla N95*

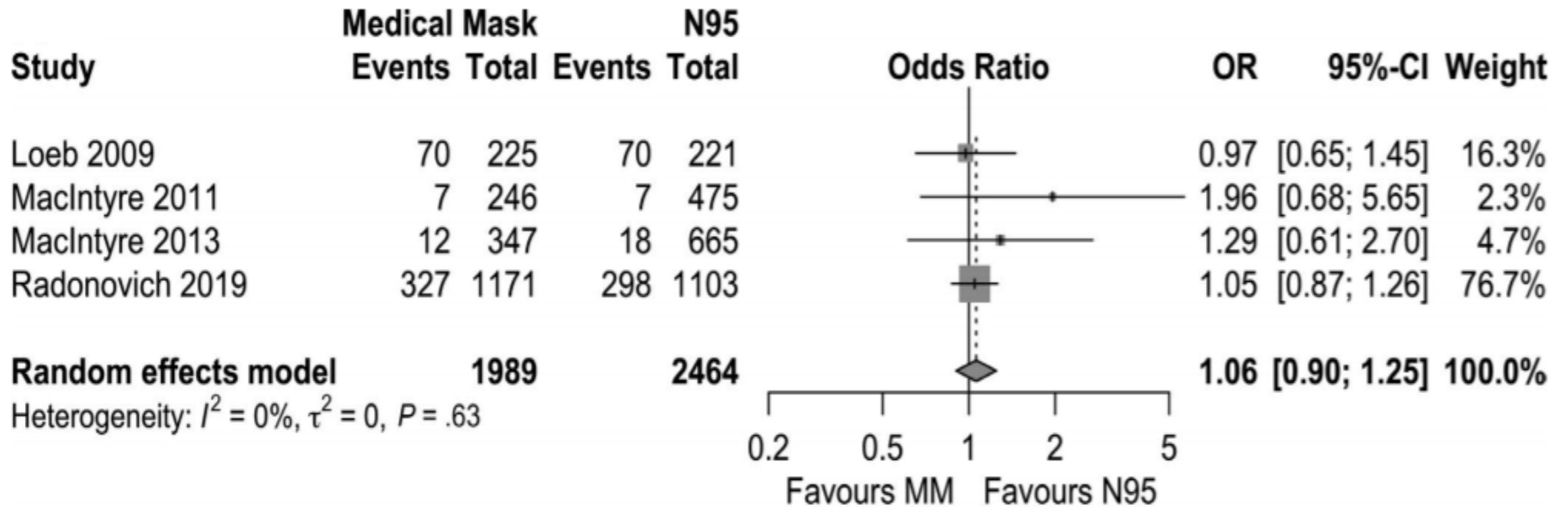


PRECAUCIONES POR GOTAS: Mascarillas



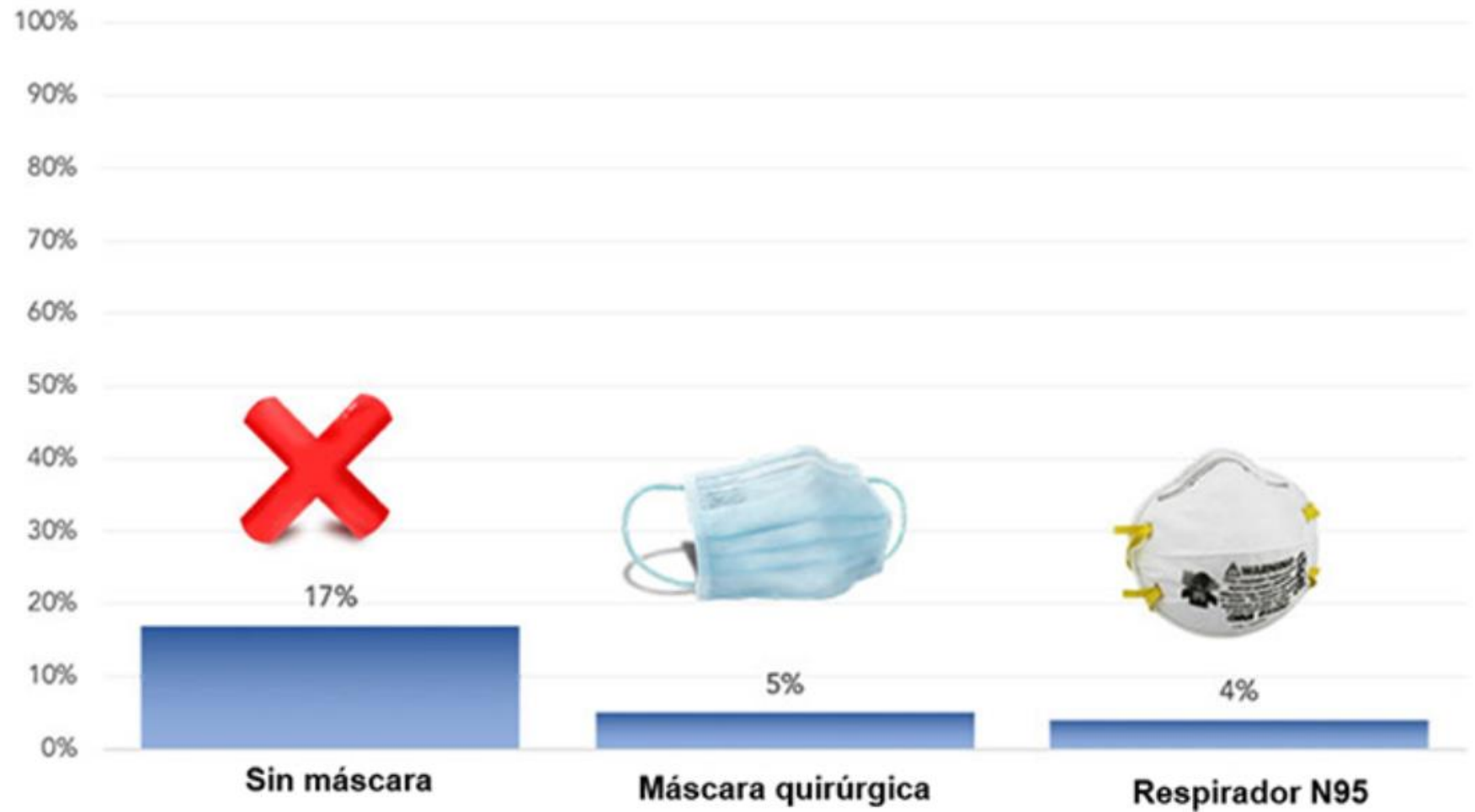
MODELOS EN VIRUS

(incluyendo Coronavirus)



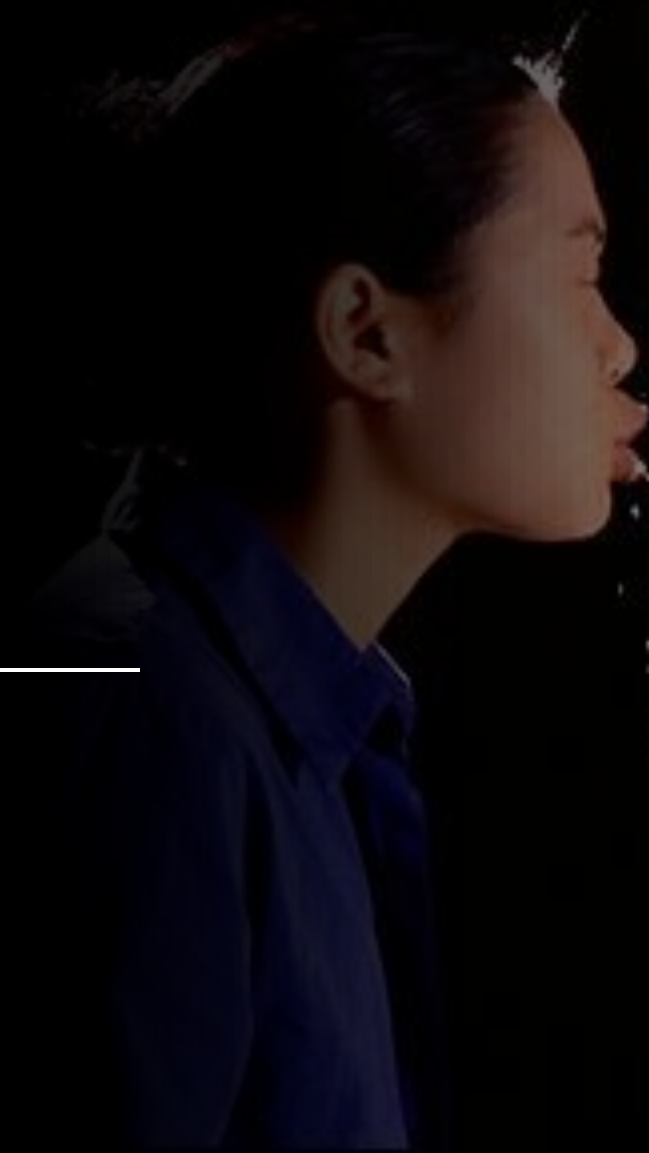
Jessica J. Bartoszko, Mohammed Abdul Malik Farooqi, Waleed Alhazzani, Mark Loeb. Medical masks vs N95 respirators for preventing COVID-19 in healthcare workers: A systematic review and meta-analysis of randomized trials. *Influenza Other Respi Viruses*. 2020;00:1–9.

RIESGO
(% INFECCIÓN)
VERSUS TIPO DE
MASCARILLA





AEROSOLS



PROCEDIMIENTOS Y AEROSOLES

Los que tienen algún nivel de evidencia

Intubación endotraqueal:

Cuatro estudios de cohorte OR=6.0 IC95%: 2,3-18,9

Cuatro estudios de casos y controles OR=6.6 IC95%: 4,1-10,6

Ventilación no invasiva:

Dos estudios de cohorte OR=3.1 IC95%: 1,4-6,8

Traqueostomía:

Un estudio de casos y controles OR=4.2 IC95%: 1,5-11,5

Ventilación manual antes de la intubación:

Un estudio de cohorte OR=2.8 IC95%: 1,3-6,4

¿CIRUGÍAS?

- No se ha publicado evidencia científica que demuestre un mayor riesgo de transmisión de SARS-CoV-2/COVID-19 con la cirugía laparoscópica y permita concluir que se debe preferir el abordaje abierto.
- No hay evidencia que indique que el uso de electrocirugía durante la laparoscopia aumente el riesgo de transmisión de la enfermedad a través del humo quirúrgico o el neumoperitoneo.
- La evidencia de virus respiratorios similares, como la gripe y otros coronavirus (SARS y MERS), no ha demostrado transmisión de la enfermedad a través del neumoperitoneo ni del humo quirúrgico.

- 1) SAGES. Resources for smoke & gas evacuation during open, laparoscopic, and endoscopic procedures. 2020 March 29. Disponible en: <https://www.sages.org/resources-smoke-gas-evacuation-during-open-laparoscopic-endoscopic-procedures>.
- 2) Zheng MH, Boni L, Fingerhut A. Minimally invasive surgery and the novel coronavirus outbreak: Lessons learned in China and Italy. Annals of Surgery. 2020 Mar 26. <https://doi/10.1097/SLA.0000000000003924>
- 3) The Royal College of Surgeons on Edinburgh. Intercollegiate General Surgery Guidance on COVID-19 update. Disponible en: <https://www.rcsed.ac.uk/news-public-affairs/news/2020/march/intercollegiate-general-surgery-guidance-on-covid-19>
- 4) Alp E, Bijl D, Bleichrodt RP, Hansson B, Voss A. Surgical smoke and infection control. J Hosp Infect. 2006 Jan;62(1):1–5.
- 5) Xiao F, Tang M, Zheng X, Liu Y, Li X, Shan H. Evidence for gastrointestinal infection of SARS-CoV-2. Gastroenterology. March 2020. <https://doi/10.1053/j.gastro.2020.02.0556>.
- 6) Brat GA, Hersey SP, Chhabra K, Gupta A, Scott J. Protecting surgical teams during the COVID-19 outbreak: A narrative review and clinical considerations. Annals of surgery. 2020 [Online ahead of print]. Disponible en: https://umbraco.surgeons.org/media/5164/covid-surgery_vf.pdf

CONCLUSIÓN:
LA MASCARILLA N95 ES MEJOR
PARA AEROSOLES

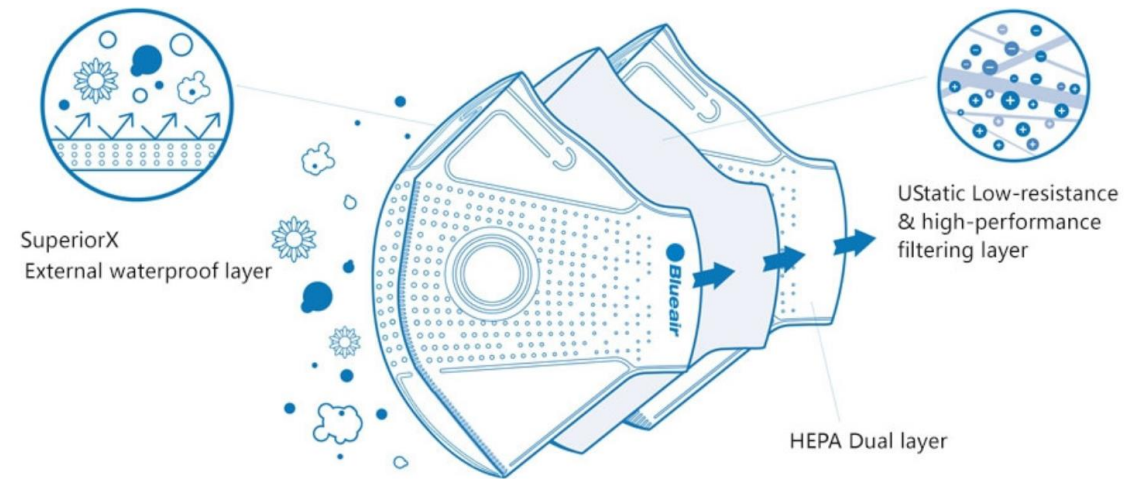
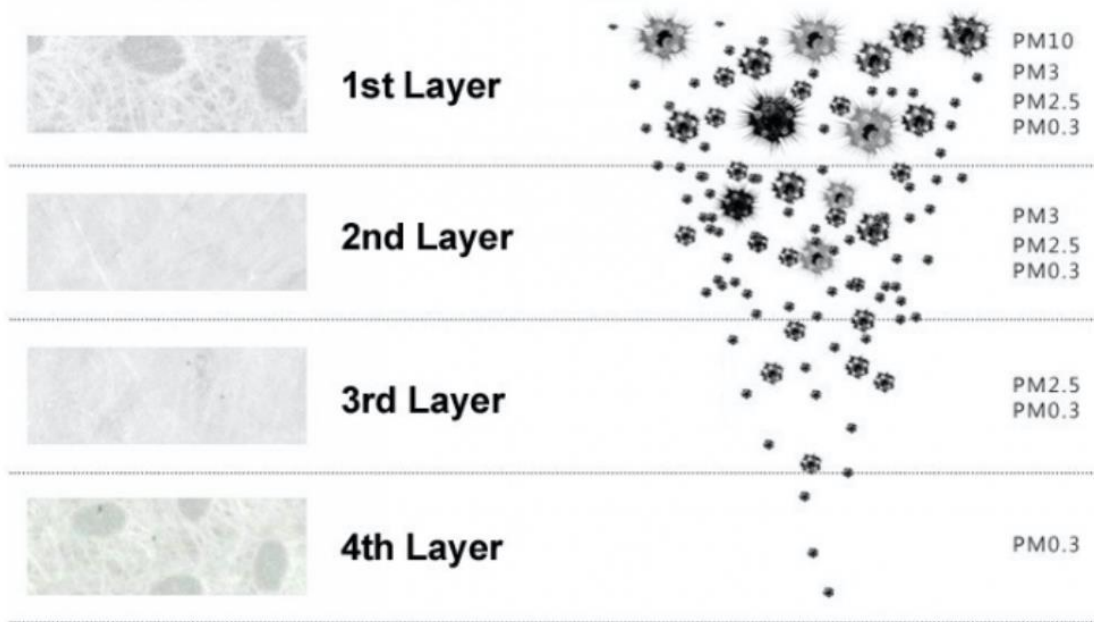


N significa **No resistente al aceite**
R significa **relativamente Resistente al aceite**
P significa **muy resistente al aceite, o a Prueba de aceite.**



MASCARILLA N95%

Se recomienda su desecho si están sucios o no son más funcionales (tiempo)





EN 149:2001+A1:2010

Dispositivos de protección respiratoria. Medias máscaras filtrantes de protección contra partículas. Requisitos, ensayos, marcado.

Respiratory protective devices - Filtering half masks to protect against particles - Requirements, testing, marking

Appareils de protection respiratoire - Demi-masques filtrants contre les particules - Exigences, essais, marquage



NIOSH-Approved Particulate Filtering Facepiece Respirators

https://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/



KN95 (95%)



MASCARILLAS N95%, FPP2 O FPP3 y KN95%

¿POR QUÉ NO USAR RUTINARIAMENTE LA N95?

- Son difíciles de tolerar y están asociadas a síntomas de cansancio como cefalea en trabajadores de salud.
- Su mal uso incrementa el riesgo de infección cruzada.

- Nickell LA, Crighton EJ, Tracy CS, et al. Psychosocial effects of SARS on hospital staff: survey of a large tertiary care institution. CMAJ 2004; 170:793-8.

- Love RG. Acceptable breathing resistance for respirator use. J Int Soc Respir Protection 1983; 1:45-66. 16.

- Kao TW. The physiological impact of N95 masks on medical staff [online] Available at: <http://clinicaltrials.gov/ct/show/NCT00173017>. Accessed February 13, 2014. 17.

- Lim EC, Seet RC, Lee KH, et al. Headaches and the N95 face-mask amongst healthcare providers. Acta Neurol Scand 2006; 113:199-202. 18.

- Dwosh H, Hong H, Austgarden D, Herman S, Schabas R. Identification and containment of an outbreak of SARS in a community hospital. CMAJ 2003; 168:1415-1420

- Ofner M, Lem M, Sarwal S, Vearncombe A. Cluster of severe acute respiratory syndrome cases among protected health-care workers—Toronto, Canada. MMWR Morb - Mortal Wkly Rep 2003; 52:433-436

- Ofner-Agostini, et al., Cluster of Severe Acute Respiratory Syndrome Among Toronto Healthcare Workers After Implementation of Infection Control Precautions: A Case Series Infect Control Hosp Epidemiol 2006; 27: 473-478.

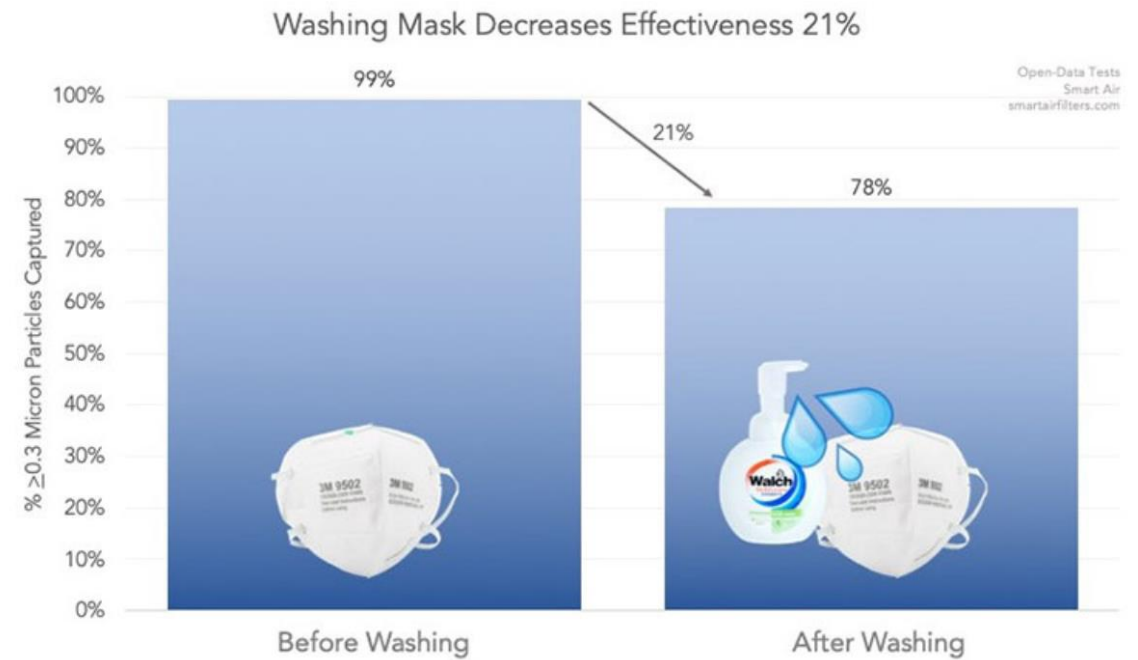
¿REUSO?



REUSO: las dos
posibles opciones...



REUSO: las peores opciones

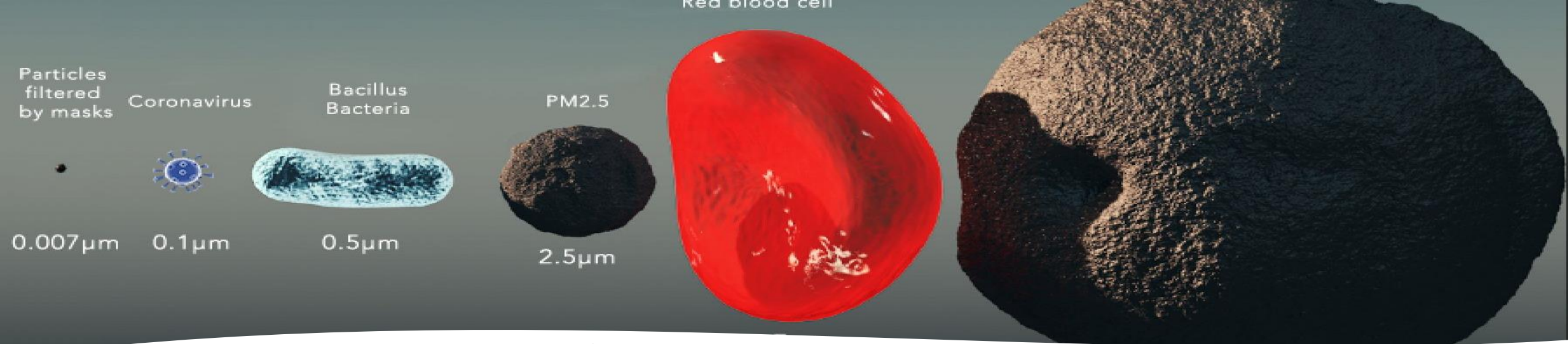


MASCARILLA P 99, T 100 Y SIMILARES



¿CUAL ES MEJOR?






PRUEBAS DE LAS N95 PARA MEDIR EFICACIA

En partículas <0,3/0,1 y 0,06 micras

- 1) N Engl J Med 2020; 382:727-733
- 2) <https://smartaifilters.com/en/blog/what-is-pm0-3-why-important/>
- 3) Hinds, W.C.: Aerosol Technology: Properties, Behavior and Measurement of Airborne Particles. New York: John Wiley & Sons, 1999.
- 4) Lenhart, S.W., Seitz, T., Trout, D. and N. Bollinger. Issues affecting respirator selection for workers exposed to infectious aerosols: emphasis on healthcare settings. Applied Biosafety. 9(1):20-36; 2004.
- 5) American Conference of Governmental Industrial Hygienists (ACGIH). Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. ACGIH. 2009.
- 6) Holden, K.L. Unmasking leading to a healthcare worker Mycobacterium tuberculosis transmission. Journal of Hospital Infection. 100(4): e226-e232, 2018.
- 7) Blachere, F.M., Lindsley, W.G., Pearce, T.A., Anderson, S.E., Fisher, M., Khakoo, R., Meade, B.J., Lander, O., Davis, S., Thewlis, R.E., Celik, I., Chen, B., and D.H. Beezhold. Measurement of airborne influenza virus in a hospital emergency department. Clinical Infectious Diseases. 48:438-40; 2009.
- 8) Stelzer-Braid, S., Oliver, B.G., Blazey, A.J., Argent, E., Newson, T.P., Rawlinson, W.D. and E.R. Tovey. 2009. Exhalation of respiratory viruses by breathing, talking and coughing. Journal of Medical Virology. 81:1674-1679.
- 9) R. Aerosol transmission of influenza A virus: a review of new studies. J.R. Soc. Interface. 6(Suppl 6): S783-S790; 2009.
- 10) Yu, I.T.S., Wong, T.W., Chiu, Y.L., Lee, N. and Y. Li. Temporal-spatial analysis of Severe Acute Respiratory Syndrome among hospital inpatients. Clinical Infectious Diseases. 40:1237-1243; 2005.
- 11) Yu, I.T.S., Li, Y., Wong, T.W., Tam, W., Chan, A.T., Lee, J.H.W., Leung, D.Y.C., and T. Ho. Evidence of airborne transmission of the Severe Acute Respiratory Syndrome Virus. The New England Journal of Medicine. 350(17): 1731-1739; 2004.
- 12) Memarzadeh F, Manning AP. Comparison of operating room ventilation systems in the protection of the surgical site. ASHRAE Transactions. 2002;108(2):3-15
- 13) American Conference of Governmental Industrial Hygienists: Bioaerosols Assessment and Control, J. Macher (ed.), Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1999.
- 14) Oberg, T. and L. Brosseau. Surgical mask filter and fit performance. American Journal of Infection Control. 36(4):276-282; 2008.
- 15) MacIntyre, C.R., Wang, Q., Rahman, B., Seale, H., Ridda, I., Gao, Z., Yang, P., Shi, W., Pang, X., Zhang, Y., Moa, A., and D.E.
- 16) Dwyer. Efficacy of face masks and respirators in preventing upper respiratory tract bacterial colonization and co-infection in hospital healthcare workers. Preventive Medicine. 62:1-7; 2014.
- 17) Cole, E.C. and C.E. Cook: Characterization of Infectious Aerosols in Health Care Facilities: An aid to Effective Engineering Controls and Preventive Strategies. American Journal of Infection Control. 26:453-64; 1998.
- 18) Morawska L, Johnson GR, Ristovski ZD, Hargreaves M, Mengersen K, Corbett S, Chao CYH, Li Y, and D. Katoshevski. Sizedistribution and sites of origin of droplets expelled from the human respiratory tract during expiratory activities. J Aerosol Sci 40:256-269; 2009.
- 19) Stelzer-Braid, S., Oliver, B.G., Blazey, A.J., Argent, E., Newsome T.P., Rawlinson, W.D., and E. R. Tovey. 2009. Exhalation of Respiratory Viruses by Breathing, Coughing, and Talking. J Med Virol. 81:1674-1679; 2009.
- 20) Centers for Disease Control and Prevention. Guidelines for Preventing the Transmission of Mycobacterium Tuberculosis in Health-care Facilities. MMWR Morb. Mortal Wkly. Rep. 43 (RR-1—RR-13); 1994.
- 21) Fennelly, K.P. et al.: Cough-Generated Aerosols of Mycobacterium Tuberculosis: A New Method to Study Infectiousness. Am. J. Resp. Crit. Care. 169:604-609; 2004.
- 22) Lee, K.W. and B.Y.H. Liu. On the Minimum Efficiency and the Most Penetrating Particle Size for Fibrous Filters. Air Pollution Control Association Journal. 30(4): 337-381; 1972.
- 23) Chen, S.K., Vesley, D., Brosseau, L.M., and J. H. Vincent. Evaluation of single-use masks and respirators for protection of health care workers against mycobacterial aerosols. Am. J. Infect. Control. 22:65-74; 1994.
- 24) Qian, Y., Willeke, K., Grinshpun, S.A., Donnelly, J. and C.C. Coffey. Performance of N95 respirators: Filtration efficiency for airborne microbial and inert particles. AIHA Journal. 59:128-132; 1998.
- 25) Willeke, K., Qian, Y., Donnelly, J., Grinshpun, S.A. and V. Ulevicius. Penetration of airborne microorganisms through a surgical mask and a dust/mist respirator. AIHA Journal. 57:348-355; 1996
- 26) Garner, P.D., Eshbaugh, J.P., Harpest, S.D., Richardson, A.W., and K.C. Hofacre. Viable viral efficiency of N95 and P100. Environ. Hyg. 10(10):564-572; 2013.
- 27) Harnish, D.A., Heimbuch, B.K., Husband, M., Lumley, A.E., Kinney, K., Shaffer, R.E., and J.D. Wander. Challenge of N95 filtering facepiece respirators with viable H1N1 influenza aerosols. Infect. Cont. Hosp. Ep. 34(5): 494-499; 2013.
- 28) Balazy, A., M. Taivola, A. Adhikari, S.K. Sivasubramani, T. Reponen and S.A. Grinshpun. Do N95 respirators provide 95% protection level against airborne viruses and how adequate are surgical masks. Am. J. Infect. Control. 34:51-57; 2006.
- 29) Eninger, R.M., Honda, T., Adhikari, A., Heinonen-Tanski, H., Reponen, T. and S. A. Grinshpun. Filter Performance of N99 and N95 Facepiece Respirators against Viruses and Ultrafine Particles. Ann. Occup. Hyg. 52(5):385-396; 2008.
- 30) Rengasamy, S., Eimer, B.C. and R.S. Shaffer. Comparison of Nanoparticle Filtration Performance of NIOSH-approved and CE-Marked Particulate Filtering Facepiece Respirators. Ann. Occup. Hyg. 53(2): 117-128; 2009.
- 31) Rengasamy, S., Verbofsky, R., King, W.P. and R. E. Shaffer. Nanoparticle Penetration through NIOSH-Approved N95 Filtering Facepiece Respirators. Journal of the International Society for Respiratory Protection. Vol. 24: 49-59; 2007.
- 32) Lore, M.B., Sambol, A.R., Japuntich, D.A., Franklin, L.M. and S.H. Hinrichs. Inter-laboratory performance between two nanoparticle air filtration systems using scanning mobility particle analyzers. Journal of Nanoparticle Research. 13:1581-1591; 2011.
- 33) Lore, M.B., Sebastian, J.M., Brown, T.L., Viner, A.S., McCullough, N.V. and S.H. Hinrichs. Performance of Conventional and Antimicrobial-Treated Filtering Facepiece Respirators Challenged with Biological Aerosols. Journal of Occupational and Environmental Hygiene. 9(2):69-80, 2011.
- 34) Hinrichs, S.H., Lore, M.B. and Brown, T.L. Filtration Performance of Five Respirator Models when Challenged with H1N1 and H5N1 Influenza Virus Aerosols. 20 October 2010 Report from University of Nebraska Medical Center to 3M Company. 2010.
- 35) Brosseau, L.M., McCullough, N.V., and D. Vesley Bacterial survival on respirator filters and surgical masks. J. Am. Biol. Saf. Assoc. 2:232-243; 1997.
- 36) Reponen, T.A., Wang, Z., Willeke, K. and S.A. Grinshpun. Survival of mycobacteria on N95 personal respirators. Infect. Control Hosp. Epidemiol. 20:237-241; 1999.
- 37) Wang, Z., Reponen, T.A. and K. Willeke. Survival of bacteria on respirator filters. Aerosol Sci. Tech. 30 (3), pp. 300-308; 1999.
- 38) Johnson, B., Winters, D.R., Shreeve, T.R. and C.C. Coffey. Respirator filter reuse test using the laboratory simulant mycobacterium tuberculosis (H37RA strain). J. Am. Biol. Saf. Assoc. 3:105-116; 1998.
- 39) Pasanen, A., Nikulin, M., Berg, S. and E. Hintikka. Stachybotrys atra corda may produce mycotoxins in respirator filters in humid environments. American Industrial Hygiene Association Journal. 55:62-65; 1994.
- 40) Eninger, R.M., Adhikari, A., Reponen, T., and S.A. Grinshpun. Differentiating Between Physical and Viable Penetrations When Challenging Respirator Filters with Bioaerosols. Clean 36(7), 615-621; 2008.
- 41) Wu, C.-Y., Lee, J.-H., Riemenschneider, L. and A.D. Theodore. Evaluation of the performance of iodine-treated biocide filters challenged with bacterial spores and viruses. Air Force Research Laboratory Report, AFRL-RX-TY-TR-2008-4511; 2008.
- 42) Qian, Y., Willeke, K. Grinshpun, S.A and J. Donnelly. Performance of N95 respirators: re-aerosolization of bacteria and solid particles. Am. Ind. Hyg Assoc. J. 58:876-880; 1997.
- 43) Kennedy, N.J. and W.C. Hinds. Release of simulated anthrax particles from disposable respirators. J. Occ. Environ. Hyg. 1:7-10; 2004.



EQUIPOS DE PROTECCIÓN INDIVIDUAL (EPI)

<https://www.cdc.gov/vhf/ebola/healthcare-us/ppe/guidance.html>





SITUACIÓN DE HACINAMIENTO EXTREMO



CASO SOSPECHOSO/POSITIVO EN CIRUGÍA



Existe muy baja evidencia que pruebe que cubrir más partes del cuerpo conduce a una mejor protección. Está demostrado que no sólo es más costoso, también influye en mayor contaminación y mas riesgo de contagio.

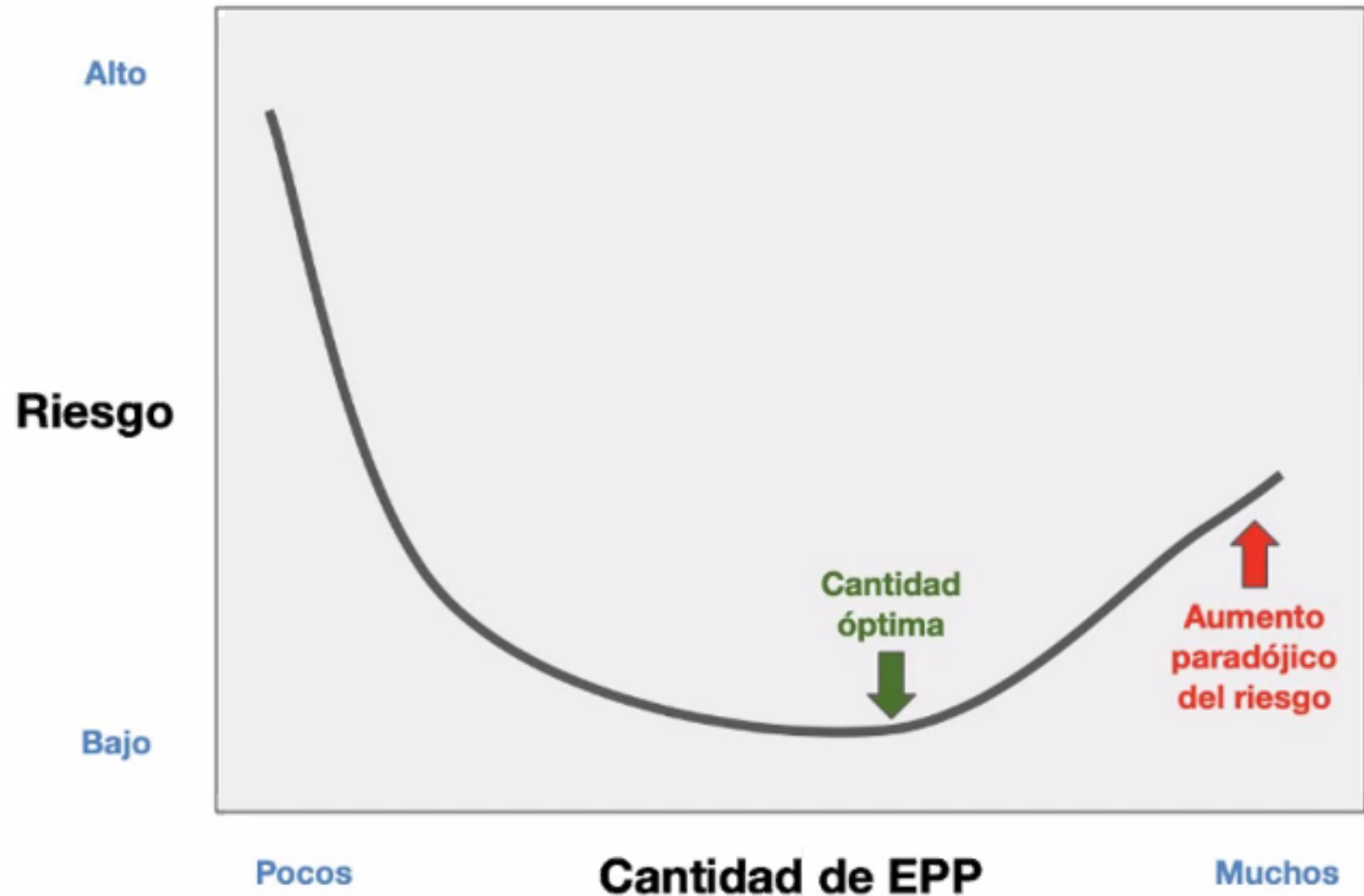
ELEMENTOS DE PROTECCIÓN PERSONAL

Mas no es mejor...

Brown TW, et al. Am J Infect Control. 2016. PMID: 27597391

Cook TM. Anaesthesia. 2020. PMID: 32246849

Pompeii LA, et al. JAMA. 2020. PMID: 32211889



@DavidRincon2810

El uso de precauciones adicionales (contacto, gotas, aerosoles) no están recomendadas para el manejo de pacientes sin factores de riesgo o síntomas para COVID-19.



LIMPIEZA Y DESINFECCIÓN DEL AMBIENTE HOSPITALARIO

DESINFECTANTES PARA AMBIENTE

AREAS HOSPITALARIAS	Desinfectante*
CRÍTICA UCI, quirófanos, salas de procedimientos.	Cloro orgánico.
SEMICRÍTICA Hospitalización	Cloro orgánico/amonios cuaternarios
NO CRÍTICA Área administrativa, pasillos.	Amonios cuaternarios.

***CON LA PARTICIPACIÓN DE INGENIERÍA AMBIENTAL**

PRODUCTO	ESPECTRO DE ACCIÓN						
	Gram +	Gram -	Micobacterias	Virus lipídicos	Virus no lipídicos	Hongos	Esporas
Cloro y compuestos clorados	+++	+++	+++	+++	+++	++	++
Compuestos de amonio cuaternario	++ +/-	++	-	+++	++	++	-

DESINFECTANTES PARA EQUIPOS BIOMÉDICOS

EQUIPOS Y DISPOSITIVOS BIOMÉDICOS	Desinfectante*
CRÍTICOS	Detergente más desinfectante (amonio cuaternario).
SEMICRÍTICOS	
NO CRÍTICOS	Biguanidas poliméricas.

***CON LA PARTICIPACIÓN DE INGENIERÍA BIOMÉDICA**

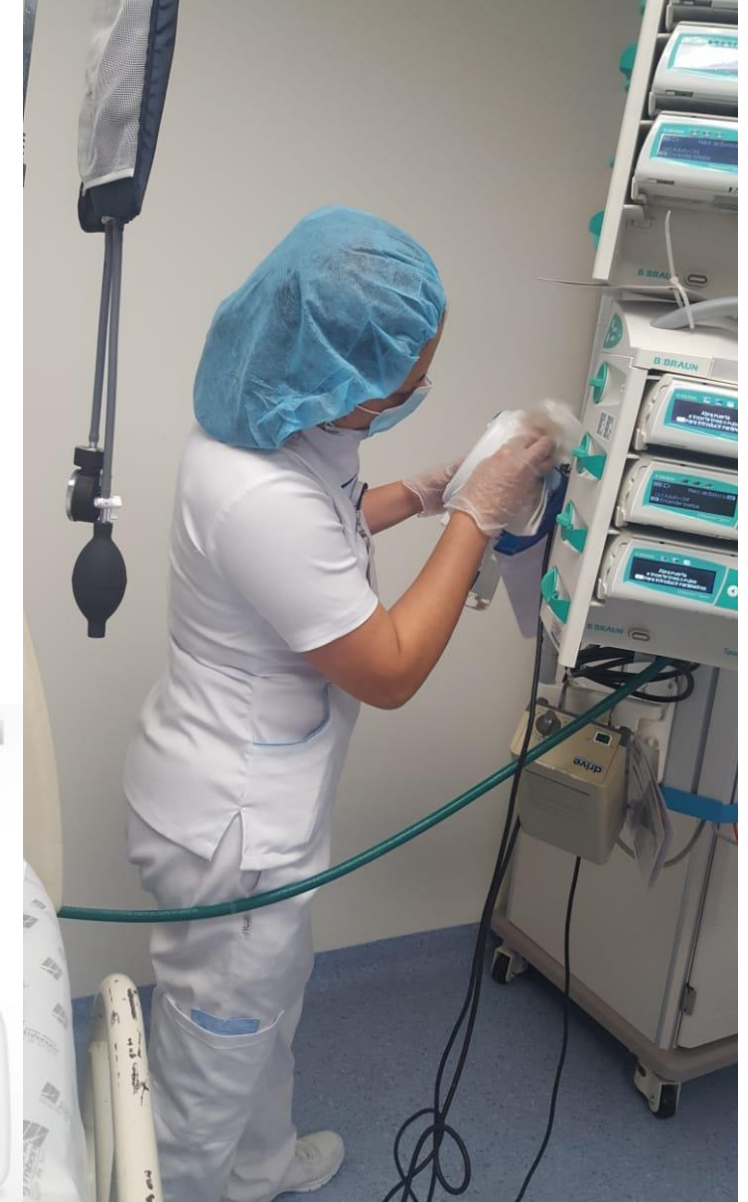
PRODUCTO	ESPECTRO DE ACCIÓN						
	Gram +	Gram -	Micobacterias	Virus lipídicos	Virus no lipídicos	Hongos	Esporas
Compuestos de amonio cuaternario	++ +/-	++	-	+++	++	++	-
Biguanidas poliméricas	+ +/-	+	-	-	-	-	-

TENER EN CUENTA: *Superficies de alto toque*

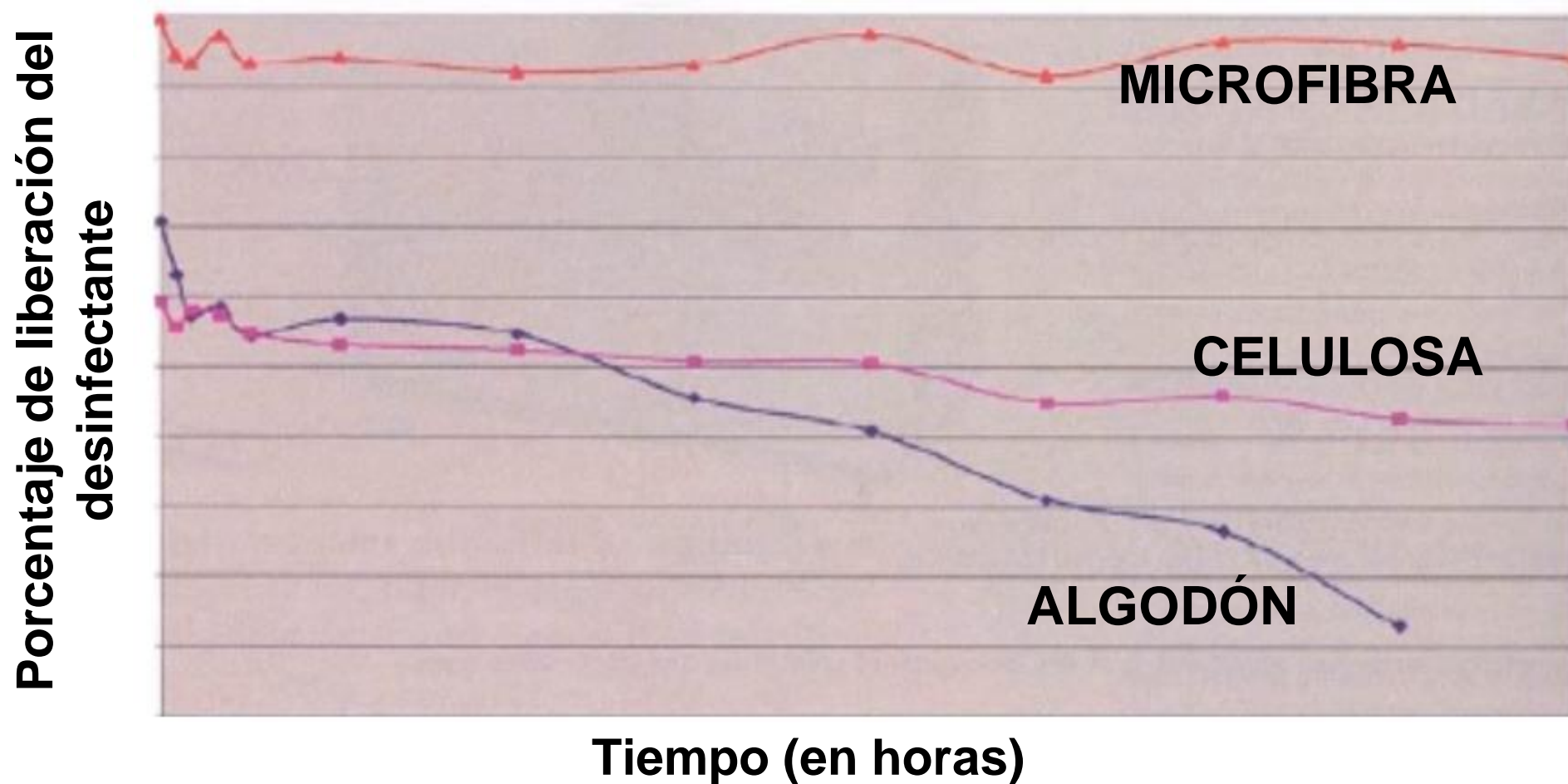


Anping Xie, Clare Rock, Yea-Jen Hsu, Patience Osei, Jennifer Andonian, Verna Scheeler, Sara C. Keller, Sara E. Cosgrove & Ayse P. Gurses (2018): Improving Daily Patient Room Cleaning: An Observational Study Using a Human Factors and Systems Engineering Approach, IISE Transactions on Occupational Ergonomics and Human Factors, DOI:10.1080/24725838.2018.1487348c

RESUMEN LIMPIEZA Y DESINFECCIÓN



TENER EN CUENTA:
Prefiera microfibra para paños y mopas SIEMPRE





$V = \frac{1}{3} \pi r^2 h$

$A = \pi r^2$

$C = 2\pi r$

$V = \pi r^2 h$

$\int \sin x dx = -\cos x + C$

$\frac{dx}{\cos^2 x} = \tan x + C$

$\int \frac{dx}{\sin x} = \ln \left| \frac{x}{2} \right| + C$

$\frac{dx}{a^2 + x^2} = \frac{1}{a} \arctan \frac{x}{a} + C$

$\frac{dx}{x} = \ln |x| + C$

$\sin^2 + b_2 x + c = 0$

$a(x^2 + \frac{b}{a}x + \frac{c}{a}) = 0$

$x^2 + 2\frac{b}{2a}x + (\frac{b}{2a})^2 - (\frac{b}{2a})^2 + \frac{c}{a} = 0$

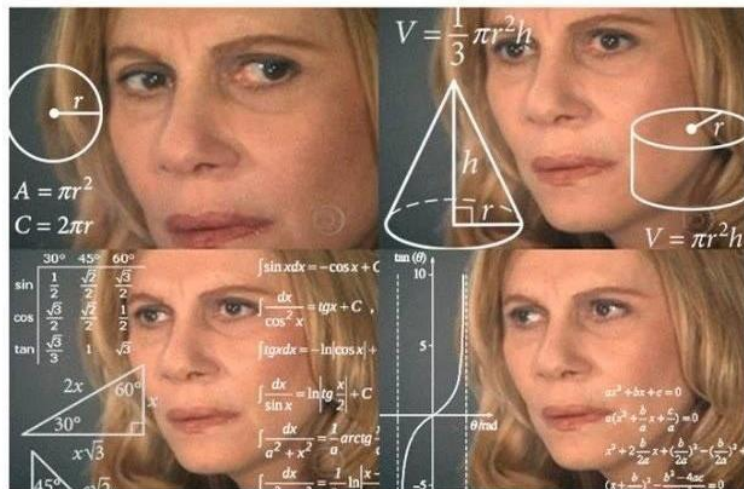
$(x + \frac{b}{2a})^2 - 4ac = 0$

	30°	45°	60°
sin	1/2	√2/2	√3/2
cos	√3/2	√2/2	1/2
tan	1/√3	1	√3

2x
30°
x√3
45°
60°

tan(θ)
10
5
-5

θ rad



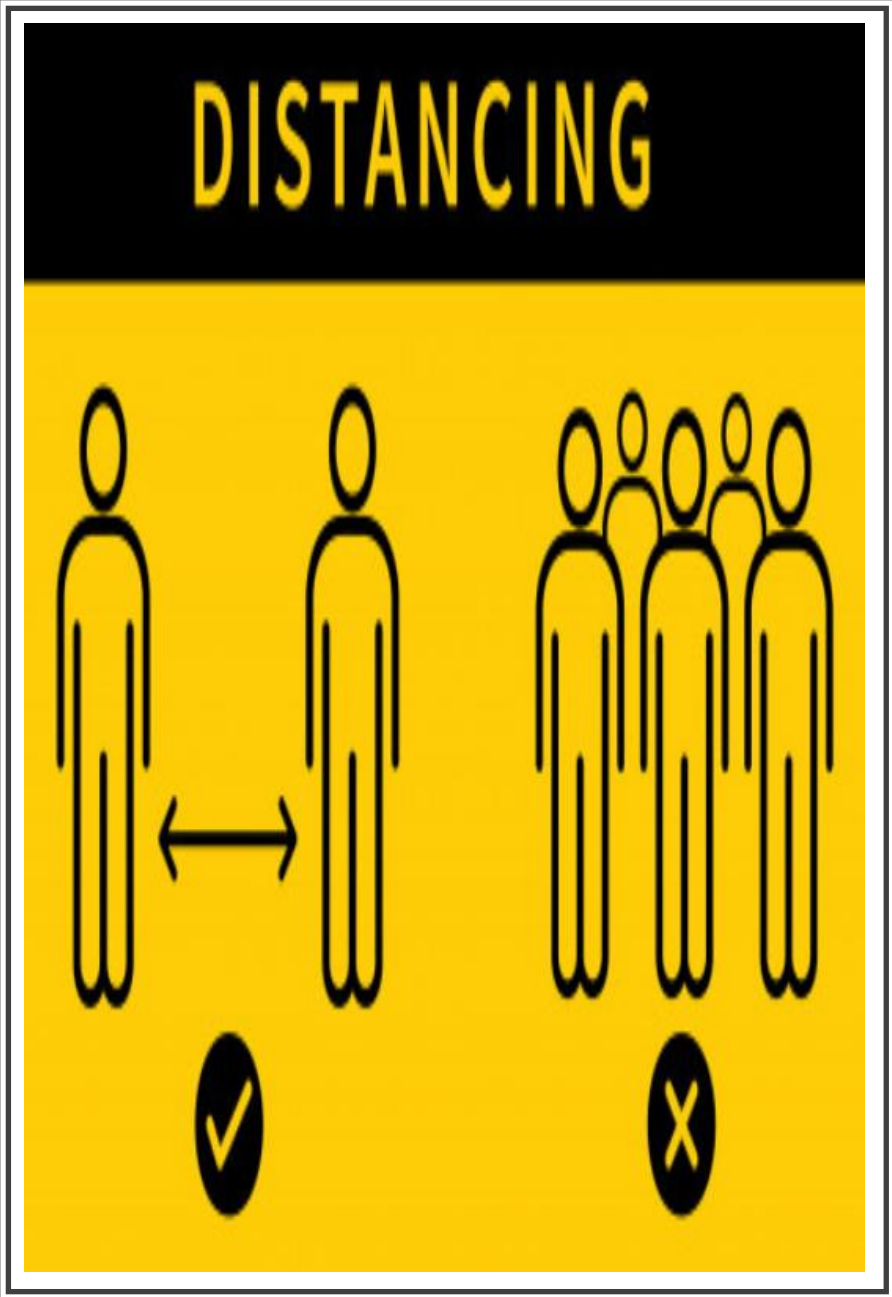


Memedroid



TENER EN CUENTA: *Microfibra para paños y mopas SIEMPRE*

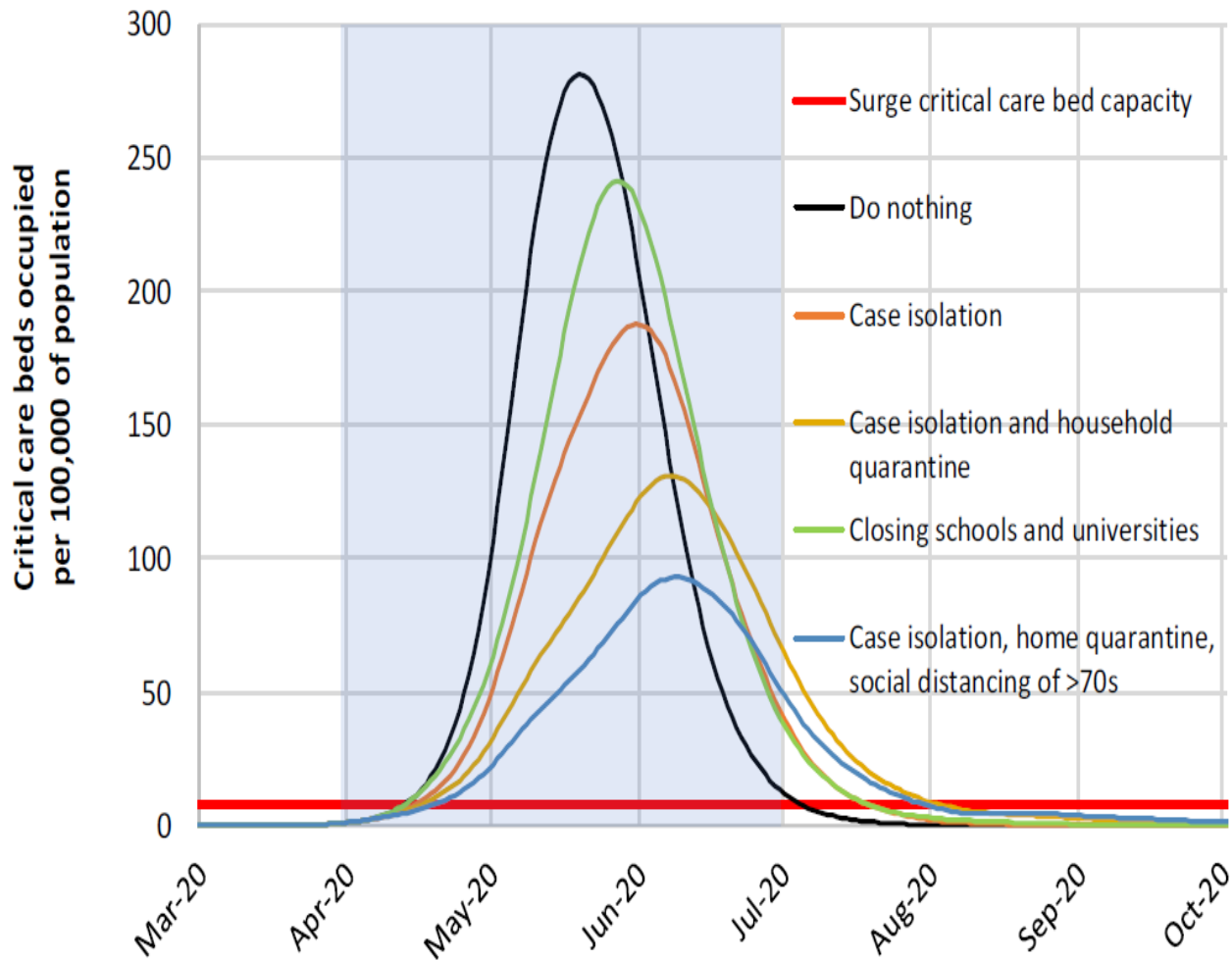




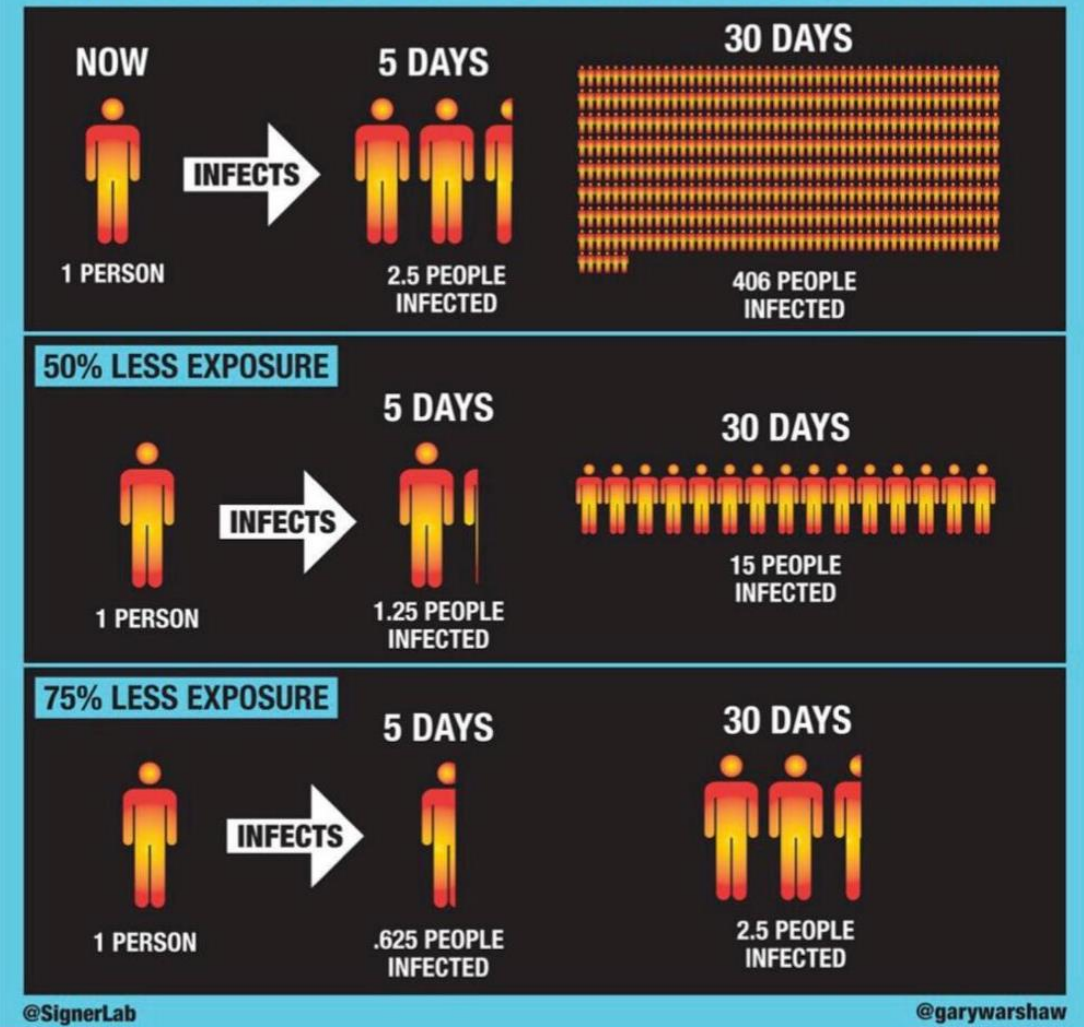
LA TRIADA FUNDAMENTAL
PARA EVITAR EL CONTAGIO

A photograph of a woman and a man sitting on a wooden park bench, separated by a significant distance. Both individuals are wearing light-colored face masks. The woman, on the left, is wearing a teal long-sleeved top and a yellow skirt, and is looking down at a smartphone. The man, on the right, is wearing a blue sweater and grey pants, also looking at a smartphone. The background shows a park setting with trees and a building in the distance. The text 'DISTANCIAMIENTO FÍSICO' is overlaid in the center of the image in a white, sans-serif font.

DISTANCIAMIENTO FÍSICO



THE POWER OF SOCIAL DISTANCING

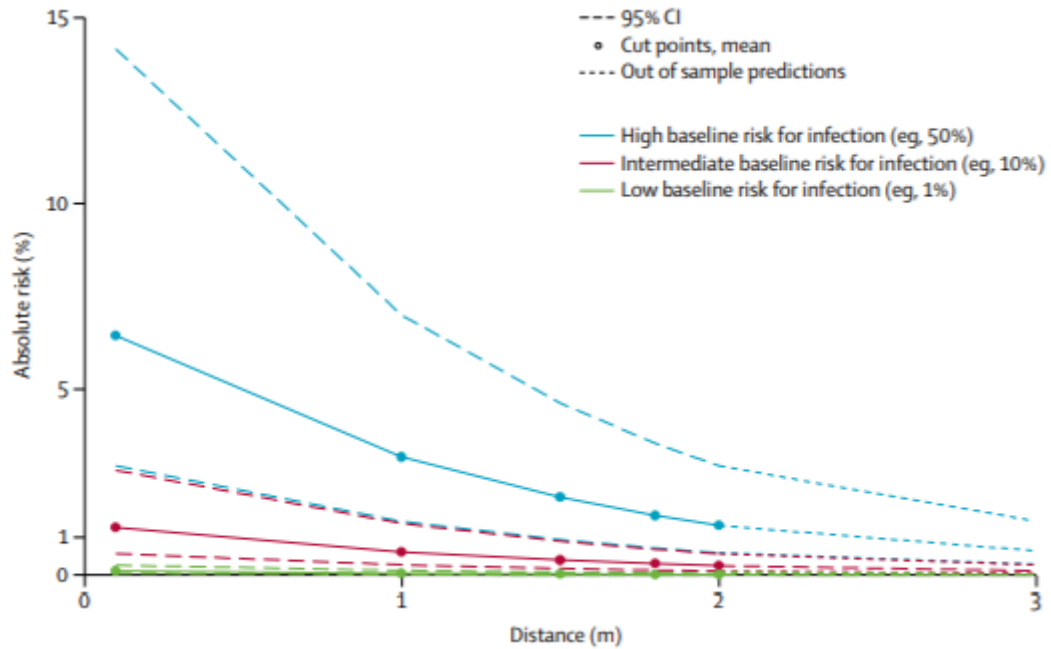
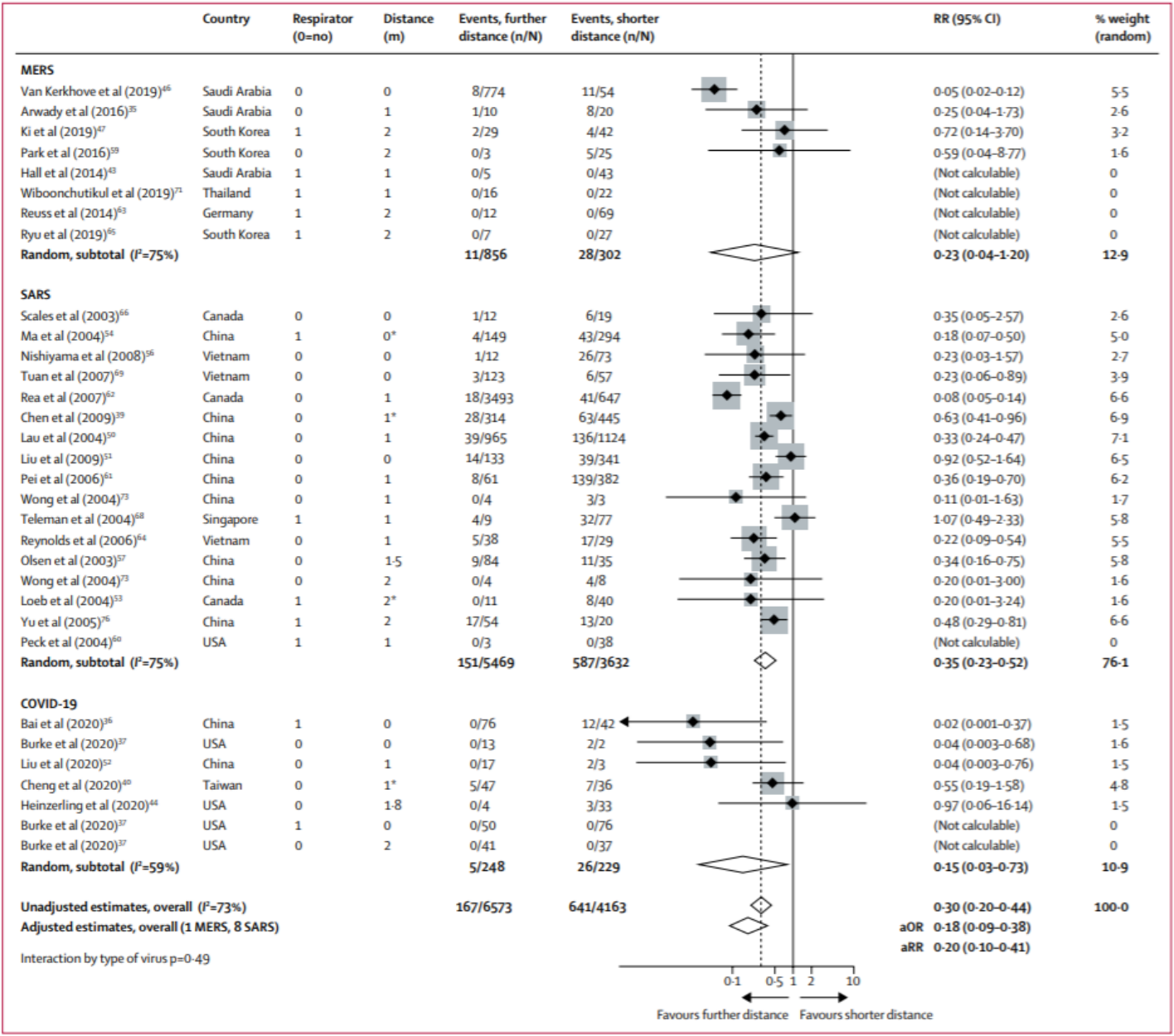


Impact of non-pharmaceutical interventions (NPIs) to reduce COVID-19 mortality and healthcare demand

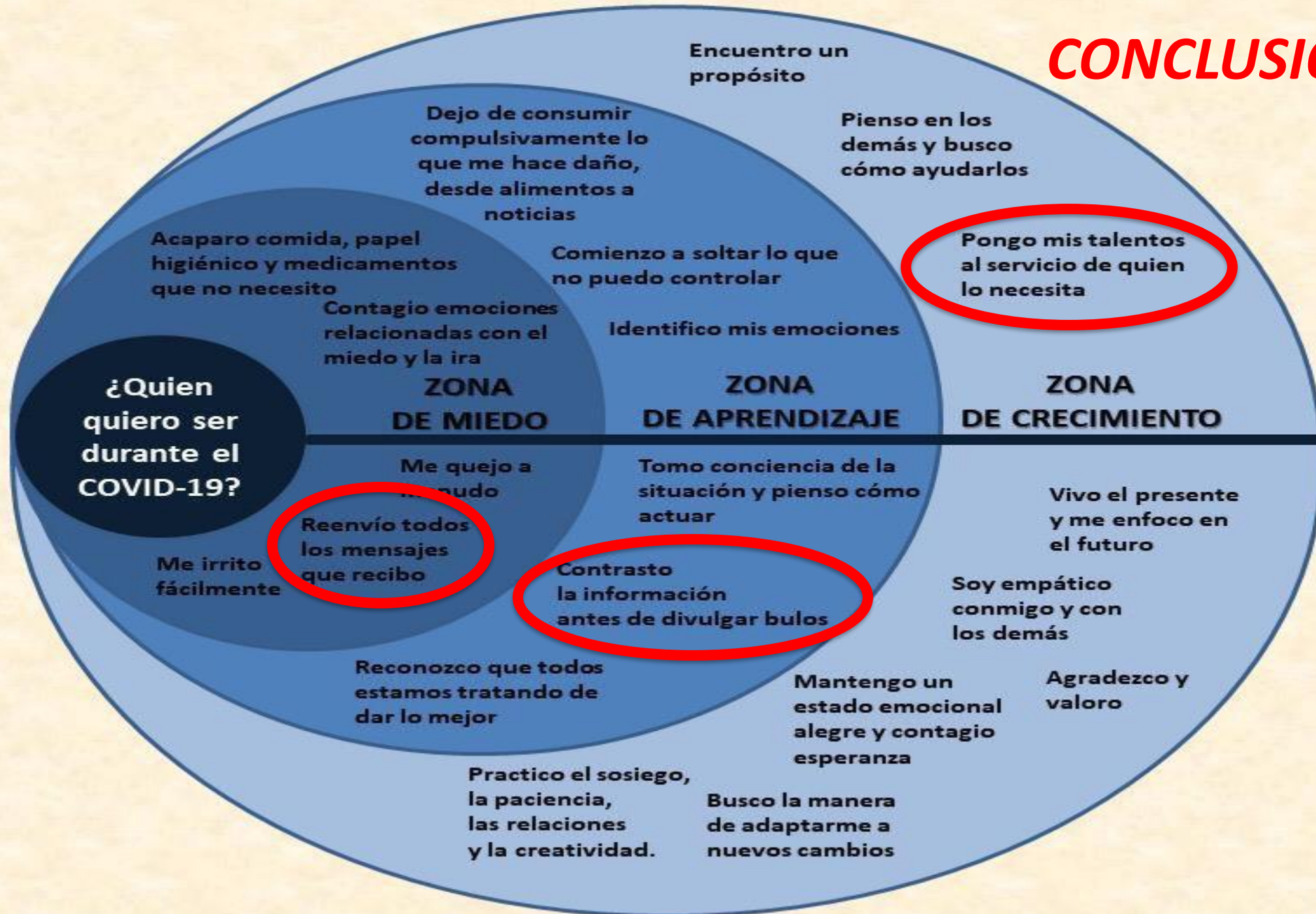
Neil M Ferguson, Daniel Laydon, Gemma Nedjati-Gilani, Natsuko Imai, Kylie Ainslie, Marc Baguelin, Sangeeta Bhatia, et al. *Imperial College COVID-19 Response Team*

DOI: <https://doi.org/10.25561/77482>

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CONCLUSIONES





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