Exploring the Decision-Making Architecture of Parents Responsible for the Vaccination Status of their School-Age Children in Northern Lower Michigan

INFORMING THE DEBATE

Michigan Applied Public Policy Research Brief

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MAPPR Policy Research Brief

Exploring the Decision-Making Architecture of Parents Responsible for the Vaccination Status of their School-Age Children in Northern Lower Michigan

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About the Michigan Applied Policy Research Briefs

INFORMING THE DEBATE

The paper series, **Informing the Debate**, is generated from an internal grant-funded initiative sponsored by the Institute for Public Policy and Social Research (IPPSR) at Michigan State University. The initiative is the Michigan Applied Public Policy Research (MAPPR) Grant Program.

The MAPPR Program supports university faculty-led research projects that are focused on current issues being discussed in communities across Michigan, and often across the nation. A paper briefing of the research follows completion of the project wherein related policy implications are presented.

The MAPPR Program came about in 1992 following a two-day meeting with leaders from the business sector, nonprofit agencies, and university faculty and staff. The group recognized the pressure on urban core leaders to critical choices having long-term impact on communities with little access to research-based information to generate a bank of research as a reference was set in the framework of the MAPPR Program.

Since, the MAPPR Program has bridged the statehouse and the university while cultivating multidimensional connections among community decision-makers. The projects as well as the briefings serve as a central point of discussion and brainstorming. The briefings are reviewed by not only Michigan stakeholders but also by other states' frontrunners who share the need for evidence-based research.

Additional information about IPPSR and the Michigan Applied Public Policy Research (MAPPR) Program is available at IPPSR or by contacting Arnold Weinfeld, associate IPPSR director, at weinfel8@msu.edu.

EXPLORING THE DECISION-MAKING ARCHITECTURE OF PARENTS RESPONSIBLE FOR THE VACCINATION STATUS OF THEIR SCHOOL-AGE CHILDREN IN NORTHERN LOWER MICHIGAN

EXECUTIVE SUMMARY

Elevated non-medical exemption (NME) rates for school-entry required vaccination can jeopardize herd immunity and are consequently associated with higher risk of vaccine-preventable disease. Michigan is currently the only state that requires parents seeking to file non-medical waivers (exemptions) for their school age children to first attend an education session exclusively in person. The added inconvenience associated with this requirement appears to have reduced NME rates in Michigan by nudging some parents toward vaccination, yet other parents who intentionally file NMEs for their school age children frequently complain that this requirement is unfair, can react defensively to the education, and infrequently change their minds. This study explores the role of parent health agency, trust (in conventional medical/health authorities), and vaccination-related social identity in the decision-making architecture of parents responsible for the vaccination-related status of their school age children. In doing so, it potentially:

1. Explains the seemingly paradoxical response in different parent subgroups to mandatory in-person waiver education; and

2. Points to a modified approach, steeped in social identity theory and social categorization theory, that can potentially optimize mandatory in-person waiver education to reduce intergroup bias and increase intergroup trust between NME-filing parents and medical/health professionals in Michigan.

Note: The following report summarizes dissertation work completed by Dan Dutkiewicz, who wishes to thank the Michigan Applied Public Policy Research Program for its support of this research and staff at the Grand Traverse County Health Department and the Benzie-Leelanau District Health Department for their cooperation with this research project.

The anti-vax movement "deeply concerns me, and puzzles me," Collins said. I think anybody who knows the history of how illnesses for which we have vaccines have killed so many people, including many, many children – you just wonder: how could we take one of the greatest advances of human biomedical research and decide that I don't want to use that on my child?"

Francis Collins, Director, National Institute of Health (As quoted by Adriana Belmonte, *Yahoo Finance*, 9 February 2020) [1]

Recently, there has been a focus on the use of psychological science in developing, implementing, and evaluating interventions to improve vaccination uptake… These principles can be broadly applied to understand the implementation of state laws for school-entry [vaccine] mandates, and develop more in-depth evaluation frameworks for assessing the use and modification of these of mandates.

Bednarczyk et al., 2019 [2]

The above quote by Francis Collins illustrates the troubling persistence of anti-vaccination beliefs held by a small but active group of parents who intentionally delay and/or refuse vaccination for their school age children. The above excerpt from Bednarczyk et al. suggests that additional focus on a psychological approach may be necessary to effectively address and counter these deeply held and seemingly unfalsifiable anti-vaccine convictions.

Problem of Non-Medical Exemptions (NMEs)

In the U.S., national coverage rates for vaccines required for school entry are relatively high, and national rates for non-medical exemptions (NMEs) are relatively low. For example, in the 2018-2019 school year, the national median vaccine acceptance rate for DTaP (diphtheria, tetanus, and pertussis) was 94.9%, and the acceptance rate for MMR (measles, mumps, and rubella) was 94.7% [3]. The national median NME rate for

kindergartners was 2.5% for the 2018-2019 school year [3]. However, state and county-level NME rates can be much higher. For example, the NME rate in Oregon was 7.5% in the 2017-2018 school year, and the NME rate for Camas County in Idaho was 26.67% in the 2016-2017 school year [4][5]. In Michigan, the NME rate on 9/30/19 (the most recent data available when accessed) for kindergartners was 13% in Leelanau County and 9.4% in Grand Traverse County in northern lower Michigan, the region where this study was conducted [6][7]. Elevated NME rates are associated with higher risk or greater odds of vaccine-preventable diseases (measles and pertussis) that jeopardize public health [8].

Ethical and Public Health Trade-Offs of Main Approaches to NME Reduction

Since the mid-2010s, multiple states have attempted to mitigate NMEs through modification of NME filing procedures, while California lawmakers have elected to eliminate NMEs altogether [2]. Both approaches entail their own unique set of ethical and public health compromises. That is, elimination can reduce NMEs (e.g., in the two states that have not allowed NMEs for decades, Mississippi and West Virginia, reported a NME rate of 0.0% in the 2017-2018 school year) [4]. However, under this approach, parents lose their right to opt out of mandatory vaccination. In addition, public health concerns exist over new post-elimination initiatives, including the potential misuse of medical exemptions as a NME substitute (which can undermine herd immunity) and the challenge of effective enforcement (the absence of which can also undermine herd immunity) [9]. Modifying or tightening NME filing procedures can also reduce NMEs rates while simultaneously preserving the right of parents to forgo mandatory vaccination. However, requiring corrective education/information focused on the benefits of

vaccines/risks of vaccine-preventable diseases in waiver education sessions may provoke identity threat in all parents strongly opposed to vaccination [10][11]. In addition, female parents strongly opposed to vaccination may additionally experience stereotype threat in gendered medical/health encounters (including waiver educational sessions) that invoke gender-based stereotypes (i.e., the stereotype that female parents are not competent to apply scientific data to vaccine-related decision-making) [12]. Identity and stereotype threat can strain the relationship between these parents and conventional medical/public health authorities.

Michigan's Unique Approach: Only State to Require Parents to Attend Waiver Education Exclusively in Person after 2015 Administrative Rule Change

In 2015, through an administrative rule change, Michigan became the only state to require parents to first attend an educational session, focused on the benefits and risks associated with school age vaccination, in person at their local health department (LHD) prior to filing NMES [13]. Seemingly, as a result, the NME rate for kindergartners fell from 5.0% to 3.4% in the year following the change [14][15]. However, according to a study based on interviews with Michigan waiver educators, parents seeking NMEs bitterly complained about this new requirement, reacted defensively, and rarely changed their minds about filing NMEs [13]. Interestingly, adding a degree of inconvenience to the NME filing procedure through mandatory in-person attendance at the educational session (i.e., expending the time and effort necessary to attend the appointment) appears to have nudged one group of parents toward vaccination. In contrast, it also appears to have further alienated another group of parents with deeply held anti-vaccination convictions. This seemingly paradoxical situation in Michigan begs two important questions:

1. How can this paradox be understood?
2. Can understanding this paradox point to a new approach that more effectively meets the needs of parents seeking to file NMEs for their school-age children?

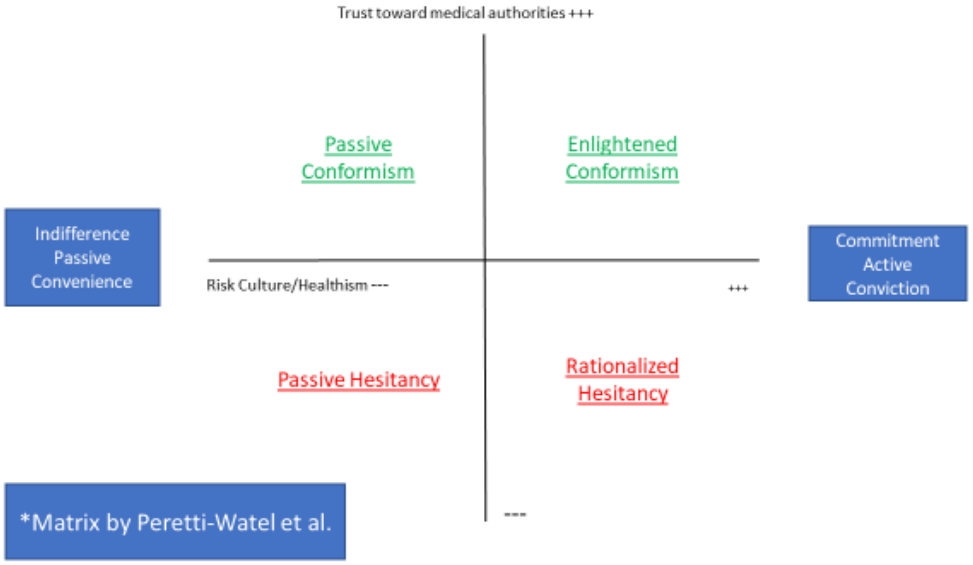
Introducing a Three-Dimensional, Vaccination-Related Decision-Making Architecture

To address these key questions, it is first necessary to introduce a new three-dimensional model to enhance characterization of the decision-making process of parents responsible for the vaccination status of their school-age children. This model builds on the two-dimensional theoretical framework introduced by Peretti-Watel et al [16]. Peretti-Watel et al. posit that parents fall into four distinct subcategories when making vaccination-related decisions for their children according to their levels of expression along two vital dimensions:

1. Risk Culture/Healthism (or health agency)

2. Trust in Conventional Medical Authorities (see Figure 1) [16].

Figure 1: Building on Vaccine Hesitancy Work of Peretti-Watel Et Al. to Enhance Characterization of the Decision-Making Process of Parents*

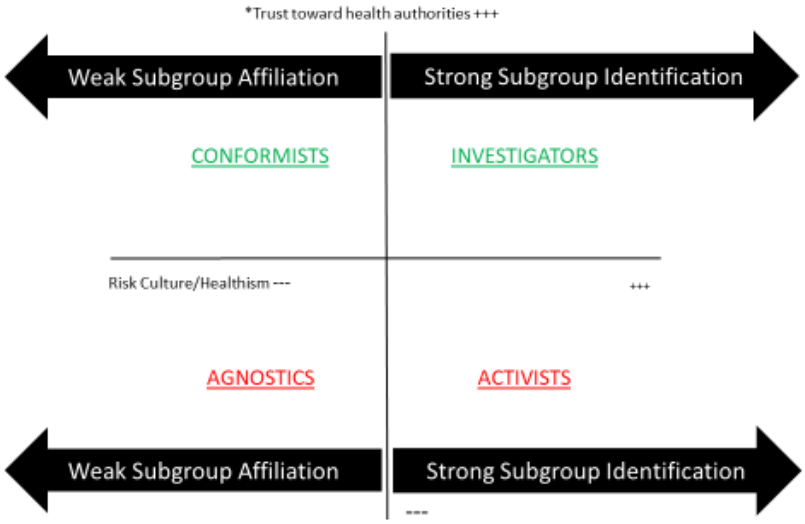


According to Peretti-Watel et al., parents who exhibit high trust in conventional medical authorities and high agency in the medical encounter are classified into the “enlightened conformism” category. For simplicity’s sake here, these parents can be relabled as “investigators” and can be imagined as the parents who elect to fully vaccinate their children after diligently completing their own research and carefully weighing the benefits and risks of childhood vaccination. Parents who exhibit low trust in conventional medical authorities and high agency in the medical encounter are classified into the “rationalized hesitancy” category. These parents can be relabed as “activists” and can be thought of more simply as the parents who elect to intentionally delay and/or refuse vaccination for their children after diligently completing their own homework and carefully weighing their decisions. In addition, according to Peretti-Watel et al., parents who exhibit low trust in conventional medical authorities and low agency in the medical encounter are classified into the “passive hesitancy” category. These parents can be relabled as “agnostics” and

can be imagined more simply as the parents who “sit on the fence” and take no action under their own initiative relative to the vaccination status of their children. Parents who exhibit high trust in conventional medical authorities and low agency in the medical encounter are classified into the “passive conformism” category. These parents can be relabled as “conformists” and can be thought of more simply as the parents who elect to fully vaccinate their children after accepting the recommendations of conventional medical authorities at face value.

Adding a social identity dimension to Peretti-Watel et al.’s theoretical framework can further clarify the roles that convenience and conviction play when parents make vaccination-related decisions for their school age children; and this clarification can explain variation in parent subgroup response to interventions that increase inconvenience through mandatory vaccination-related education. Most importantly, perhaps, adding social identity into the theoretical mix can introduce a new approach to mandatory in-person education that improves the quality of the intergroup relationship between activist parents and conventional medical/public health authorities through trust enhancement and bias reduction. The basic idea is that investigator and activist parents are more affiliated with a subgroup identity based on a prototypical characteristic related to vaccination (either favorable or unfavorable to vaccination), compared to agnostic and conformist parents who are relatively unaffiliated with a subgroup identity defined by the same prototypical representation *(see Figure 2).*

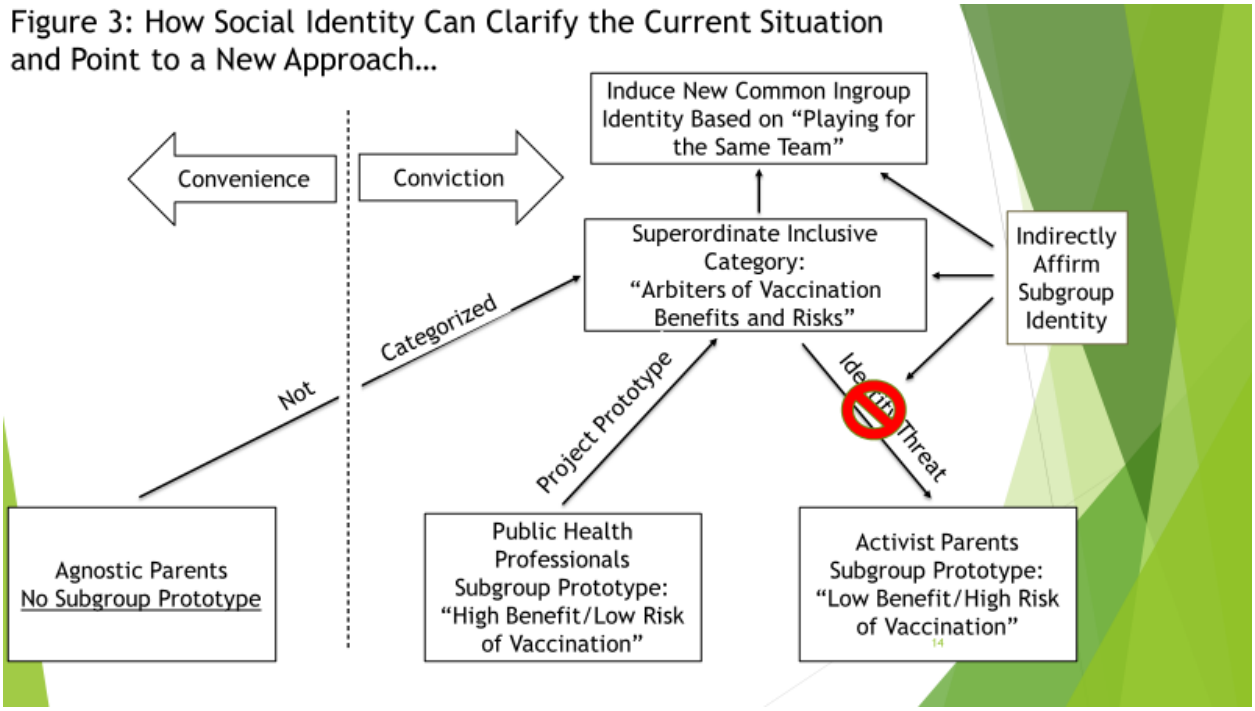
Figure 2: Integrating Social Identity and Social Categorization to Further Enhance Characterization of Parents Responsible for the Vaccination Status of their School-Aged Children



Agnostics and activists are highlighted in red above, as they theoretically pose a higher risk of intentionally delaying and/or refusing vaccination for their school age children, which makes them of greatest interest from a public health perspective.

The basic principles of social identity and social categorization theory [17][18][19][20][21][22] can be applied to clarify where the role of convenience and conviction begins and ends in the decision-making process of parents responsible for the vaccination status of their school age children. That is, activist parents can be thought of as possessing a social identity defined by a “low benefit/high risk of vaccination” prototype, and agnostic parents can be thought of as devoid of possessing a social identity defined by a vaccination-related prototype *(see Figure 3).* This absence of a vaccination-related prototype and corresponding social identity leaves agnostic parents uncategorized and effectively removed from competing with public health professionals who possess a social identity of their own, defined by a “high benefit/low risk of vaccination” prototype, over which

prototype should dominate the health encounter or the public debate over vaccination *(see Figure 3).*



Without strong fidelity to a vaccination-related prototype, agnostic parents theoretically are susceptible to convenience-based nudges when making vaccination-related decisions for their school age children. In contrast, public health professionals with strong fidelity to a favorable vaccination-related prototype compete directly with activist parents exhibiting equally strong fidelity to an unfavorable vaccination-related prototype to establish the dominance of their respective vaccination-related prototypes in a more inclusive, superordinate category, "Arbiters of Vaccination Benefits and Risks" *(see Figure 3)*. Continuing to apply social identity and social categorization theory, public health professionals, representing the dominant ingroup, can be thought of as projecting their favorable vaccination-related prototype on to the common superordinate category *(see Figure 3).* Once projected, this prototype serves as the principle criterion for evaluating the legitimacy of the "low benefit/high risk of vaccination" prototype that

defines the social identity of activist parents. Negative evaluation can inadvertently provoke social identity threat in activist parents *(Figure 3),* which can theoretically spur these parents to counterproductively intensify their commitment to an unfavorable vaccination-related prototype in order to maintain the “positive distinctiveness” of their vaccination-related social identity. In other words, activist parents may intensify their opposition to vaccines as a result of social identity threat.

However, social identity and social categorization theory have been applied to improve intergroup harmony in other non-vaccination-related contexts [23][24][25][26][27][28], and these principles can be harnessed to theoretically strengthen the intergroup relationship between activist parents and public health professionals. Following these principles, inducement of a new higher order inclusive superordinate identity based on a shared sense of team membership can interrupt the process of ingroup projection that ultimately triggers social identity threat in activist parents *(see Figure 3).* In addition, public health professionals at the outset of waiver education sessions can indirectly affirm the unique subgroup identity of activist parents in health domains outside of vaccination (if such evidence could be discovered) without directly affirming the anti-vaccination convictions of this parent subgroup, which is antithetical to the public health mission *(see Figure 3).*

Inducement of a more inclusive superordinate social identity category with simultaneous acknowledgement of the “positive distinctiveness” of activist parents can theoretically reduce bias and increase trust between activist parents and public health professionals.

Study Hypotheses

The following study hypotheses were investigated based on the three-dimensional theoretical framework developed above:

Hypothesis 1: *Activist and agnostic parents can be accurately classified based on measures of the healthism and trust constructs.*

Hypothesis 2: *Activist parents, compared to agnostic parents, excel at promoting healthier non- vaccination related behaviors in their school age children.*

Hypothesis 3 (Part 1): *Agnostics, compared to activists, are more sensitive to convenience when considering vaccination for their school age children.*

Hypothesis 3 (Part 2): *Activists, compared to agnostics, are more sensitive to role of social encouragement and potential social loss when considering vaccination, or changes in opinion about vaccination, for their school age children.*

Study Assumptions

A major assumption of this study is that parents who wait until the end of July or later to fully vaccinate their child entering seventh grade at their LHD are truly agnostic parents based on the timing of their vaccination-related decision-making (that is, the necessity of complying with school-entry immunization requirements compels these parents to take action.) A related major assumption of this study is that parents who file NMEs for their child entering seventh grade at their LHD during the same period are truly activist parents based on the strength of their unfavorable vaccination-related convictions (that is, conviction makes these parents impervious to the influence of timing on their vaccination-related decision-making.) In addition, this study focuses on families with children entering seventh grade, rather than kindergarten, based on the idea that these families may exhibit greater variation in non-vaccination related health behaviors and metrics.

Target Population, Sampling Frame, And Sample Population

The target population for this study is comprised of parents and their children entering seventh grade in predominantly public school who utilize vaccination-related services at their LHDs to comply with school-entry immunization requirements through vaccination or NME filing. The sampling frame is comprised of parents and their children entering seventh grade in predominantly public school who utilize LHD services at the Grand Traverse County Health Department or the Benzie Leelanau District Health Department between July 29, 2019 and October 14, 2019 to comply with school-entry immunization requirements for the 2019-2020 school year, either through vaccination or NME filing (following mandatory waiver education). Drawn from the sample frame, the study sample consists of:

1. 26 parents who utilize LHD services to vaccinate their children entering seventh grade for the 2019-2020 school year;
2. 25 parents who utilize LHD services to file a NME for their children entering seventh grade for the 2019-2020 school year;
3. 26 school age children of the above 26 parents utilizing LHD services to fully vaccinate their children entering seventh grade; and
4. 25 school age children of the above 25 parents utilizing LHD services to file a NME for their children entering seventh grade.

Not all parents were offered an opportunity to complete the survey, and non-response rates could not be recorded across the study enrollment period. As a result, utilization of a convenience sampling method in this study likely introduces selection bias (that is, the

sample population is not representative of the target population), which is a major limitation of this study.

Study Design and Study Variables

The study design is cross-sectional, with a one-time survey. Main study variables include:

Demographic (parents and school age children)	Main Explanatory Variable	Main Outcome Variables
Age of parent (self-report)	Parent subgroup membership, agnostic v. activist (parent self-report)	Healthism (parent self-report)
Age of student (parental report)		Trust in medical/health authorities (parent self-report)
Gender of parent, including non-binary option (self-report)		Health metrics of children, including Family, Nutrition, and Physical Activity (FNPA) survey scores (parent self-report) and BMI (parent self-report)
Gender of student, including non-binary option (parental report)		
Ethnicity of parent (self-report)		Sensitivity measurements 1, 2, and 3 (sensitivity to vaccination-related convenience measures) (parent self-report)
Ethnicity of child (parental report)		
Educational attainment of parent (self-report)		Sensitivity measurements 4 and 5 (sensitivity to social encouragement/support measures) (parent self-report)
Family income (self-report)		

Statistical Analyses

Statistical analyses performed include correlational testing, conditional probabilities, parametric testing (t-tests and linear regression), and nonparametric sensitivity testing (Mann-Whitney test). Not all results are shown in this report.

Main Results

Hypothesis 1: Can Levels of Healthism and Trust Predict Activist and Agnostic Parent Classification?

The sensitivity of the trust/healthism assessment for agnostic parents is zero, ruling it out as an effective screening tool for use by LHDs. This result also calls into question this study's major assumption that parents electing to vaccinate their child entering seventh grade in the period just prior to the start of the school year truly fall into the agnostic category. More likely, the parents accepting scheduled vaccination enrolled in this study represent a mixture of unknown proportions of mostly investigator and conformist parents who simply procrastinate until the last moment to comply with school-entry immunization requirements through vaccination (for simplicity's sake, these parents will now be referred to as vaccinating parents.) In contrast, the sensitivity of the trust/healthism assessment for agnostic parents is 42% (with a specificity of 96%), but its reliability as a screening tool is still too low to be utilized by LHDs. However, the effectiveness of this assessment can be increased by adding a second dimension of trust to the screening tool that was carried out in post-hoc analysis *(see Discussion Section for more details)*.

Hypothesis 2: Do Activist Parents, compared to Vaccinating Parents, Excel More at Promoting Healthier Family Environments and Healthier Individual (Child) Behaviors Unrelated to Vaccination?

In unadjusted analyses, activist parents, compared to the vaccinating parents, exhibit significantly higher mean scores on the Food, Nutrition, and Physical Activity Survey (65.17 v. 62.54; p-value=0.101) and on a subsection of the survey limited solely to physical activity measures (16.68 v. 15.42; p-value=0.070). This survey was utilized to gain insight into family and child health behaviors not related to vaccination. However, these significant associations are no longer statistically significant when adjusted for other potential confounders (e.g., gender, education, and income). As a result, this study does not find evidence that can be deployed during the health/medical encounter to indirectly affirm the unique subgroup identity of activist parents and to subsequently avoid the potentially negative consequences of vaccination-related social identity threat. However, in a surprise finding not hypothesized, male parents are significantly associated with lower FNPA Survey and FNPA Physical Activity Scores, and this finding can be potentially utilized in the medical/health encounter to affirm the health activist tendencies of female parents responsible for the vaccination status of their school age children. Such an approach offers a potentially important new tool for simultaneously reducing social identity threat (based on a vaccination-related prototype) and stereotype threat (based on gender) in female activist parents.

Hypothesis 3 (Part 1): Are Vaccinating Parents, Compared to Activist Parents, More Sensitive to The Role of Convenience When Making Vaccination-Related Decisions for Their School Age Children?

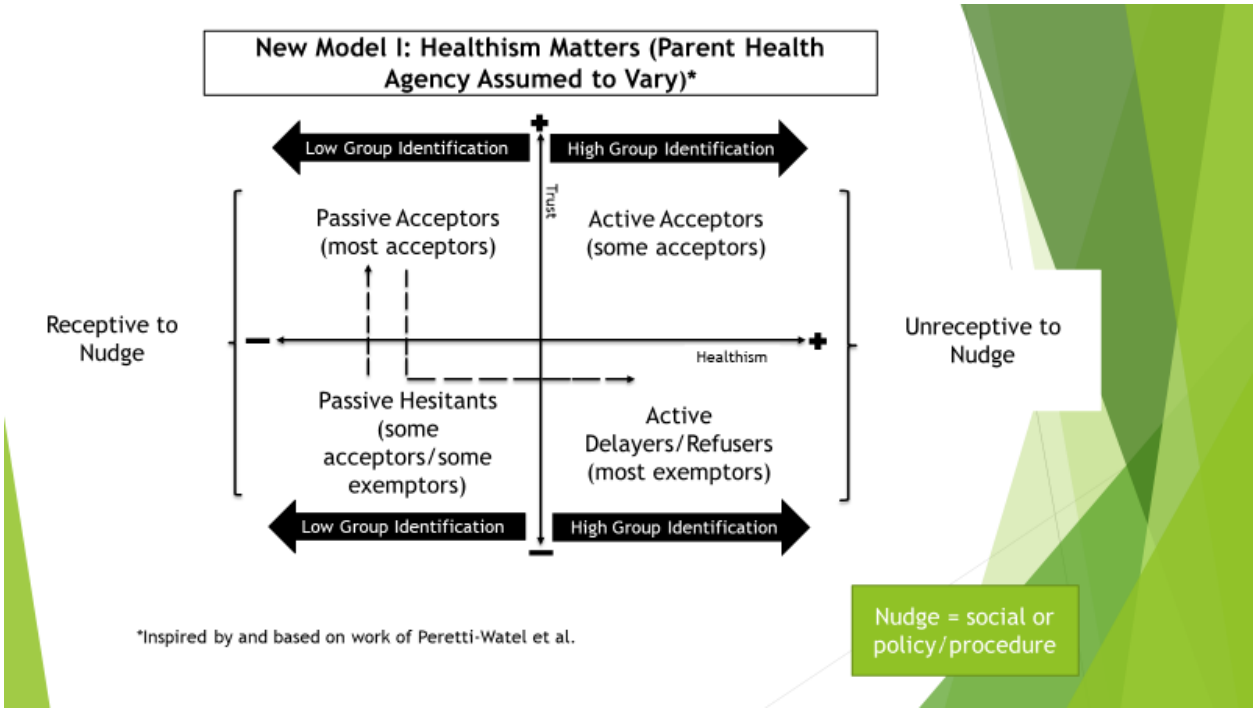
Hypothesis 3 (Part 2): Are Activist Parents, Compared to Vaccinating Parents, More Sensitive to The Role of Social Encouragement and Social Support When Making Vaccination-Related Decisions for Their School Age Children?

In unadjusted analyses, activist parents, compared to the vaccinating parents, exhibit significantly higher mean scores on all inconvenience-related measures, and these associations remain significant in fully adjusted analyses considering the potential confounding influence of parent age, ethnicity, gender, education, and income (p-value for total inconvenience=<0.0001; p-value for inconvenience related to mandatory waiver education session attendance=0.0065; p-value for inconvenience related to school dismissal (in the event of an outbreak)= <0.0001; and p-value for shot-related inconvenience=0.0024). Surprisingly, the vaccinating parents, not the activist parents (as hypothesized), exhibit significantly higher scores on sensitivity measures of total social encouragement and support and social encouragement only when considering vaccination-related decisions for their school age children in unadjusted analyses. These associations remain significant in fully adjusted analyses considering the potential confounding influence of parent age, ethnicity, gender, education, and income (p-value for total social encouragement/support=0.0250; and p-value for social encouragement only=0.0151). Together, these findings suggest that the vaccinating parents can be successfully nudged toward vaccination from two possible sources, social pressure or a policy/procedure that adds inconvenience to the process of delaying and/or refusing vaccination.

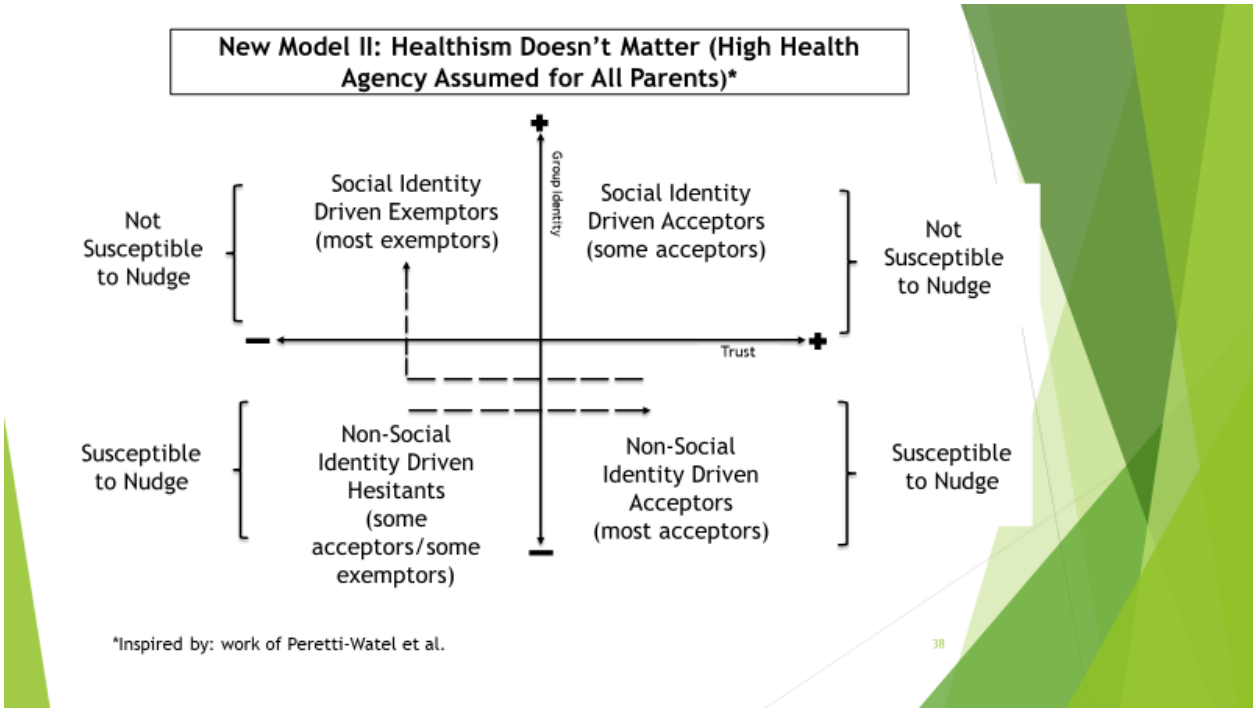
Discussion

Related to *Hypothesis 1*, the similarly high mean healthism scores for both the vaccinating and the activist parent groups (9.68 v. 9.56) potentially can stem from two sources: Either that the healthism phenomenon is so ubiquitous in the general population that no difference in levels of healthism expression exists between the parent groups or that the healthism survey question cannot reliably assess the healthism construct. In fact, the healthism survey question utilized in this study, "*It is my role as a parent to actively make decisions about shots for my child,"* may be too general, and all parents in the sample may express strong agreement with the statement, for example, simply to maintain their sense of being competent, involved parents. In addition, relative to *Hypothesis 1*, post-hoc inclusion of a second trust measure (trust in the efficacy and safety of vaccination) improves the sensitivity of the screening tool to 75%, while just mildly degrading the specificity (88%). Related to Hypothesis 2, some doubt exists over the stability of the mean FNPA Survey Score and the mean FNPA-PA Sub-Score for the male activist parents due to the small number of these parents enrolled in the study with calculable scores (N=5). In future studies with larger sample sizes, it is possible that male activist parents could exhibit higher mean scores on these types of non-vaccination related health measures. Relative to *Hypothesis 3*, the surprise but informative finding that the vaccinating parents, not the activist parents, are more sensitive to the role of social encouragement/support may be attributable to the utilization of survey questions that do not directly engage the social identity of the activist parents. This possibility can be clearly demonstrated by contrasting the social encouragement question utilized in this study, "Encouragement from other people is important to me when I consider my child's

shots" to an improved version of the same question developed post-hoc, "I am open to encouragement from people who do not share my beliefs about vaccination when I consider my child's shots." That is, activist parents, bound to a social identity defined by a "low benefit/high risk" vaccination-related prototype, would be expected to disagree more strongly, compared to the fully vaccinating parents, unbound to a social identity defined by vaccination-related prototype, with the post-hoc version of the question because it more actively engages (and challenges) the social identity of activist parents. Since this study does not generate reliable evidence that can clarify the role of healthism in the decision-making architecture of parents responsible for the vaccination status of their school age children, it proposes two decision-making models, with *Model I* operating under the assumption that healthism does matter (that is, the healthism measure utilized in this study is unreliable) and *Model II* operating under the assumption that healthism doesn't matter (that is, healthism is ubiquitous in the general population). In *Model I*, the idea is that parents exhibiting a high degree of healthism and strong identification with a vaccination-related social identity are unreceptive to convenience and social pressure-based nudges, while parents exhibiting a low degree of healthism and weak identification with a vaccination-related social identity are receptive to the same types of nudges *(see Model 1)*.



Those unreceptive parents exhibiting low trust in conventional medical/health authorities (and posing the greatest public health risk) would benefit from a social identity-based intervention that systematically induces a new superordinate common identity between medical/health professionals and these parents, while simultaneously indirectly affirming the unique social identity of these activist parents. *Model I* also potentially illuminates the counterproductive mechanism by which parents who trust conventional medical/health authorities can be persuaded by social pressure to shift into a more vaccine agnostic or vaccine-resistant category. In contrast, *Model I* potentially demonstrates the productive process by which parents low on trust and weak on vaccination-related social identification (vaccine-agnostic parents) can be persuaded by convenience or social pressure to shift into a more vaccine-accepting category. In *Model II*, the idea is that parents exhibiting strong identification with a vaccination-related social identity, irrespective of their trust levels, are unreceptive to convenience or social



pressure-based nudges, while parents exhibiting weak identification with a vaccination-related social identity, irrespective of their trust levels, are receptive to the same types of nudges *(see Model II).*

Model II also potentially illuminates the counterproductive process by which vaccine-accepting and vaccine-agnostic parents can be persuaded to shift into a more vaccine-resistant category. In contrast, *Model II* potentially demonstrates the productive mechanism by which vaccine-agnostic parents can be nudged by inconvenience or social pressure to shift into a more vaccine-accepting category.

Public Health Implications

Since 2015, waiver educators in Michigan deserve credit for taking it upon themselves to shift focus in waiver education sessions away from directly challenging the deeply held convictions of activist parents with information about the risks of vaccine preventable

diseases and the benefits of vaccines to a more practical approach that emphasizes long-term trust building between these parents and conventional medical/health authorities [13]. However, a more systematic, evidence-based approach is needed that intentionally accounts for and consistently addresses the social identity-related needs of these parents in waiver education sessions. Consideration, therefore, should be given to modifying the current approach to waiver education in Michigan by:

- Inducing a new common ingroup identity between waiver educators and activist parents based on promoting the concept of shared team membership through utilization of contracts, posters, and symbols that emphasize the value of teamwork during the medical/health encounter; and
- Developing a new messaging strategy aimed at female activist parents that directly affirms the gender-based social identity and indirectly affirms the health activist-based social identity of these parents (and female vaccinating parents) through validation of their efforts to promote healthy family environments and to encourage their school-age children to adopt healthy individual behaviors in domains outside of vaccination.

However, these suggested modifications should be thoroughly reviewed and adjusted by a social psychologist with expertise in the application of social identity and social categorization theory and then be rigorously tested prior to implementation in a small pilot study or randomized trial for effectiveness and to avoid inadvertent backfiring events (e.g., ingroup projection that could increase, not decrease, intergroup bias). In addition, consideration should be given to assessing levels of trust in conventional medical/health authorities and trust in vaccines in parents who fully vaccinate their school age children,

and following those assessments, to offering conventional waiver education to the parents who score lowest on this assessment. Finally, consideration should be given to thinking beyond the conventional medical/health encounter, to bringing together activist parents and vaccine scientists in a novel community forum designed to decrease intergroup bias and increase intergroup trust through a series of activities built upon the principles of social identity and social categorization theory.

Study Limitations

As previously noted, utilization of convenience sampling is a major limitation of this study. A second major limitation of this study is its small sample size. All study results therefore should be considered provisional until observed associations can be replicated in a larger study. Additional limitations of this study include possible set (survey) response bias and another source of information bias introduced from reliance on parent self-reported data. Finally, it is important to note that:

1. The observed associations in this study may be confounded by other unassessed variables (e.g., private school attendance);

2. Due to the cross-sectional design of this study, no causal inferences can be made (all associations should only be considered correlational at this point), and the direction of associations could be reversed (as time-order cannot be determined).

Conclusion

The temptation will always exist to assume that generating new knowledge focused on the safety and efficacy of vaccines required for school-entry can effectively counter the strongly held convictions of parents who elect to intentionally delay and/or refuse

vaccination for their school age children. However, conventional public health efforts to promote the safety and efficacy of vaccines have fallen short in effectively countering vaccine opposition, much to the disappointment and frustration of public health officials. As a result, at the present time, it is difficult to imagine that such a strategy can be successful in the absence of a complementary approach well-grounded in social identity and social categorization theory.

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